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In the Supreme Court of the United States

OCTOBER TERM, 1974

Supreme Court, U. S.
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C. MARSHALL DANN, COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

THOMAS R. JOHNSTON

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

ROBERT H. BORK,
Solicitor General,
THOMAS E. KAUPER,
Assistant Attorney General,
GERALD P. NORTON,
Assistant to the Solicitor General,
HOWARD E. SHAPIRO,
RICHARD H. STERN,
Attorneys,
Department of Justice,
Washington, D.C. 20530.

KARL E. BAKKE,
General Counsel,
Department of Commerce,
Washington, D.C. 20230.
JOSEPH F. NAKAMURA,
Solicitor,
JERE W. SEARS,
Deputy Solicitor,
United States Patent and Trademark Office,
Washington, D.C. 20231.

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The Solicitor General, on behalf of the Commissioner of Patents and Trademarks, petitions for a writ of certiorari to review the judgment of the United States Court of Customs and Patent Appeals in this case.

OPINIONS BELOW

The opinion of the Court of Customs and Patent Appeals (App. A, *infra*, pp. 1A–22A) is reported at 502 F. 2d 765. The opinion of the Patent and Trademark Office Board of Appeals (App. C, *infra*, pp. 25A–36A) is not reported.

JURISDICTION

The judgment of the Court of Customs and Patent Appeals (App. B, *infra,* p. 23A) was entered on October 11, 1974. On December 12, 1974, the Chief Justice extended the time for filing a petition for a writ of certiorari to February 16, 1975. The jurisdiction of this Court is invoked under 28 U.S.C. 1256. *Gottschalk* v. *Benson,* 409 U.S. 63.

QUESTIONS PRESENTED

1. Whether this Court's holding in *Gottschalk* v. *Benson,* 409 U.S. 63, that a new idea to be implemented by programming an existing computer is unpatentable when claimed as a new "process," also applies when the programmed computer is claimed as a new "machine system."

2. Whether programs for existing general purpose digital computers, however claimed, are patentable under present law.

3. Whether respondent's idea of having banks provide an additional bookkeeping service by programming their computers to sort check and deposit data in accordance with category codes was in any event no more than an obvious improvement over prior art.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, clause 8, of the Constitution of the United States provides:

> The Congress shall have Power * * *
>
> * * * * *
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries * * *.

35 U.S.C. 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

35 U.S.C. 103 provides:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

STATEMENT

Respondent applied (R. 4)[1] for a patent on a system for using existing general purpose digital computers in conducting the banking business. The system permits a bank to offer checking account customers a bookkeeping service that not only provides the usual overall balance and activity statement, but also furnishes subtotals for various categories of debits and

[1] "R." refers to the record filed in the Court of Customs and Patent Appeals.

credits, such as rent or fuel, sales income or dividends, etc. Under respondent's system, the customer labels each check (or deposit slip) with an appropriate numerical category code for the type of transaction. The bank records this category code on the check (or deposit slip) in magnetic ink characters and stores the category data in the memory of the bank's computer, along with the other data normally associated with the transaction.[2] At the end of the monthly statement period, the bank's computer sorts the customer's transactions according to category codes, and causes information concerning each transaction and a subtotal to be printed out for each category (App. A. pp. 3A–7A, *infra*).[3] Respondent stated that his "invention is being sold as a computer program to banks * * * so that they can perform these data processing services for depositors" (*id.* at 19A).

[2] According to the patent application, banks use digital computers "for the handling of much of the record-keeping operations involved in a banking system" (R. 5). Typically, checks and deposit slips carry the following information (among other data) in magnetic ink (or other machine-readable) characters printed on them: customer's account number, amount of the transaction, and whether the transaction is a deposit (credit) or check (debit). This information is printed in magnetic ink to facilitate the processing of such data by the bank's computer. The applicant's system adds another such item: the code for the transaction category (rent, etc.), so that the computer can process this item along with the others (R. 6–7).

[3] The result is analogous to the customer's writing "rent," "fuel" or the like on each check as he draws it (or similarly marking each deposit slip) and, upon receipt of each monthly statement, sorting out the cashed checks and the deposit slips in each category into a separate pile and adding up the sub-totals for each pile.

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The patent application describes the necessary steps in the operation, contains flow diagrams for the operation of this type of program, and gives as an example a specific program for use on the IBM 1400 series general purpose digital computer. Respondent sought to patent the system both as a "process" and as a "machine system" or apparatus.[4] A typical "machine system" claim, set out in the opinion of the court below (*id.* at 5A–7A), in addition to describing the usual operations of such a computer, provides in substance:

> A record-keeping machine system for financial accounts, said system comprising a data processor (such as the IBM 1400) including the usual components, and having means for processing category-coded transaction data to compute subtotals for each category, as well as means for producing an output record of each category's subtotal.

The patent examiner rejected all the claims, and respondent appealed to the Patent and Trademark Office Board of Appeals. The Board rejected the claims on several grounds. It said that the claims were "not directed to improved record keeping machinery, but rather to a broad system of keeping financial records where the distinction over acknowledged prior record-keeping is either in the identity of the * * * institution which has custody of certain phases of the bookkeeping operation or in * * * the relationship existing between the various records," and the claims thus do not "spell out * * * any particular configuration of business machinery" (App. C., p. 29A, *infra*). Such claims do not define a statutory patentable ma-

[4] As used in the patent law, the terms "machine" and "apparatus" are synonymous.

chine, the Board stated, because the invention, if any, is only in the meaning (rent account, dividend account, etc.) given by the user to the pattern of electrical signals stored in the computer's memory. A A preexisting computer "operating with any given stored program is not a different machine simply because one chooses to denominate a section of its memory by a term descriptive of one meaning" rather than another (*id.* at 30A).[5]

The Board concluded that there was "no essential difference in substance" between the "machine system" or "apparatus" format used in the claims involved here and respondent's "process" claims able under 35 U.S.C. 101 (see p. 3, *supra*). The "machine system" or apparatus claims simply covered a conventional data processor having "'means' for performing conventional bookkeeping and accounting operations" (*ibid.*). The Board therefore held that the "machine system" claims and the process claims "must stand or fall together" (*ibid.*), and rejected them all as involving subject matter that is unpatentable under 35 U.S.C. 101 (see p. 3, *supra*). The Board also ruled that the claims were "obvious variations" (App. 34A, *infra*) of conventional bookkeeping systems and of a system previously disclosed in a prior patent (the Dirks patent, cited by the examiner) and hence were unpatentable under 35 U.S.C. 103 (see p. 3, *supra*).[6]

[5] The Board did not adopt the examiner's rejection and instead substituted its own (pursuant to 37 C.F.R. 1.196), deferring to the view of the Court of Customs and Patent Appeals "that an unprogrammed, or a differently programmed, general purpose computer is [not] the same machine as the one that would result from appellant's programming of the same or of a similar computer" (App. 28A, *infra*). The Board noted that the Examiner had apparently operated on the contrary "premise" (*ibid.*)

Subsequent to the Board's decision this Court decided *Gottschalk* v. *Benson,* 409 U.S. 63, holding unpatentable a claim for a "process" to be embodied in a program and used in a general purpose digital computer. On appeal to the Court of Customs and Patent Appeals, respondent abandoned its "process" claims and pressed only its alternative "machine system" claims.

The Court of Customs and Patent Appeals reversed 3-to-2, holding that *Benson* applied only to process claims and was not "applicable" to apparatus claims (App. 14A, *infra*). Because respondent's claims expressly purported to cover a "machine system," the court rejected the Board's conclusion that the application claimed subject matter that was unpatentable under Section 101 (*id.* at 13A–14A). *Benson* was

[6] The conventional systems to which the Board referred are multiple account systems by which banks carry "special," "trust," "escrow," or "personal" accounts for a single customer. By combining totals from the statements for each of the accounts into a single statement, the bank can readily furnish the customer the same kind of data as the applicant claims to do in his alleged invention (App. 34A–35A, *infra*). The Dirks patent claimed certain computer devices, but its introductory specification explained and disclosed, among other things, a cost accounting system for mercantile establishments. The Board considered it obvious to modify that system to implement respondent's idea since the only appreciable difference between the two ideas was whether they were employed in stores (Dirks) or banks (respondent) (App. 35A, *infra*).

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also inapposite, in the court's view, because Benson's claims covered a mathematical formula or algorithm, in contrast with respondent's business or financial record-keeping system (*id.* at 14A). Finally, the court overturned the Board's rejection for obviousness because it did not regard respondent's alleged invention as "equivalent" to the prior art (*id.* at 15A–16A).

Chief Judge Markey dissented on the obviousness issue. The mere fact that differences existed between the prior art and the claimed advance, he said, did not suffice to make the advance unobvious (*id.* at 16A–17A).

Judge Rich dissented separately on the basis of *Benson* (*id.* at 17A–22A). Respondent's invention, if any, he said, was a program to be used in an existing general purpose digital computer. That the respondent's claims were cast in the language of a product claim format ("machine system" or "apparatus") rather than a process claim format was immaterial, since "[e]very competent patent draftsman knows how to do that," and Benson could readily have cast his process claims in "machine system" form similar to respondent's (*id.* at 20A). Judge Rich stated that the "legal doctrine that a new program makes an old general purpose digital computer into a new and different machine," on which the majority implicitly relied in its opinion, was a "legal fiction" which was not helpful in deciding whether a program claimed as such a "machine" was patentable in view of *Benson* (*id.* at 19A). Since the majority's distinctions between the instant case and *Benson* were not "realistic" and

were a matter of "form rather than substance," Judge Rich found *Benson* controlling and would have affirmed the rejection (*id.* at 21A–22A).

REASONS FOR GRANTING THE WRIT

The decision of the Court of Customs and Patent Appeals, by narrowly limiting the application of this Court's decision in *Gottschalk* v. *Benson, supra,* to "process" patents, permits and invites circumvention of that decision by the facile drafting device of claiming as a "machine system" an idea for programming computers that *Benson* held would be unpatentable if claimed as a "process" (see, *e.g.*, App. 37A, *infra*).[7] In holding that the Patent Office must grant a patent monopoly on such a machine system claim (if novel and unobvious), the decision conflicts not only with *Benson,* as to the patentability of computer programming, but also with other rulings of this Court and the courts of appeals that ideas are not patentable, whether claimed as processes or as products. Because of its immediate impact on computer programming, this decision would have a serious adverse effect on the computer industry and thus on the economy at large. More generally, the decision's implications could have a serious adverse effect on competition in the use of business and other ideas. To await infringement litigation to test the validity of such patents on computer programming would create serious and costly

[7] We have set out in Appendix D to this brief (p. 37A) the typical *Benson* claim printed at 409 U.S. 73–74, recast in respondent's "machine system" format.

uncertainty in industry and in the administration of the Patent Office.

1. (A) In considering inventions involving the use of digital computers it is useful to focus on three modes of activity: (1) formulating the ultimate purpose to be served by a computer operation; (2) implementating that purpose or idea by determining what data should be stored in the computer's memory or included in the input to the computer and what steps the computer should be instructed to take in processing the data; and (3) translating those instructions into a special form and "language" that the computer can "read." The term "program," while in a sense referring only to the product of the third phase, which typically involves a rather routine operation, is also used generically to encompass the second phase as well.

The inventiveness—the novel discovery—claimed by respondent does not lie in the preparation of a computer program, although respondent concedes that that is the commercially-exploitable fruit of the claimed invention (see p. 4, *supra*). Rather, it resides in the general idea or purpose which the computer would be programmed to implement, which idea (unlike the means for implementing it) respondent claims is sufficiently novel and unobvious to be patentable.

More specifically, respondent's claimed "invention" consists of the idea of having banks program and use their existing computers, by means of conventional programming techniques, to perform for their customers simple bookkeeping services that the customers either perform for themselves, hire a bookkeeper to perform, or else forego. The service consists of preparing balance statement subtotals for credits and debits in designated categories such as rent, fuel, dividends, sales income and the like. The "invention" is marketed to banks in the form of an appropriate computer program, which the banks can then use on their conventional general purpose digital computers (*e.g.*, the IBM 1400). The principal question presented is whether the court below properly held that this is the kind of "Discovery" contemplated by the patent clause of the Constitution and by 35 U.S.C. 101, on which a seventeen-year monopoly against the public may be granted.

(B) Ideas, however unobvious they may be, have always constituted "nonstatutory" and thus unpatentable subject matter. What is patentable is the specific and tangible application of those ideas to a specific use, in which the idea is concretely embodied in a novel and inventive machine, article of manufacture, chemical or other physical composition, or process for making or using such machinery, manufactures, or compositions. The rationale of the rule against patenting mere ideas is that hindering the free exchange and spread in use of mathematical and scientific ideas by an indiscriminate grant of patent monopolies would obstruct, rather than promote, "the Progress of Science and useful Arts" (U.S. Const., Art. I, Sec. 8, cl. 8).

Thus, this Court stated in *Benson* that "[p]henomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work." 409 U.S. at 67; see *O'Reilly* v.

Morse, 15 How. 62, 112–113. The same principle has been applied to business ideas, because patents on methods of transacting business would be as destructive of competition as patents on scientific ideas would be destructive to scientific progress. See *Joseph E. Seagram & Sons, Inc.* v. *Marzall,* 180 F. 2d 26, 28 (C.A.D.C.) (denying patent on method of testing consumer product preferences).[8]

For example, the idea of the self-service cafeteria, like Morse's idea of transmitting information at a distance by means of electromagnetic force (see *Benson, supra,* 409 U.S. at 68), cannot be patented. See *Loew's Drive-In Theatres, Inc.* v. *Park-In Theatres, Inc.,* 174 F. 2d 547, 552 (C.A. 1), certiorari denied, 338 U.S. 822. No matter how novel, such ideas can be the basis for a patent, if at all, only in terms of and to the extent of, their embodiment in a novel machine, such as the Morse telegraph apparatus or the coin-operated food dispensing machine used in certain cafeterias, or in a novel process.

Respondent's claimed invention is not like a novel telegraph apparatus or any other piece of tangible machinery. The "means" disclosed by respondent are those of an ordinary general purpose digital computer, with a program directing the components of the com-

[8] The federal courts have repeatedly held that ideas for methods of doing business are not patentable. *E.g., Guthrie* v. *Curlett,* 10 F. 2d 725 (C.A. 2) (method of abbreviating rail tariff schedules); *Berardini* v. *Tocci,* 190 F. 329, 332–333 (S.D.N.Y.), affirmed on the opinion below, 200 F. 1021 (C.A. 2) (system of using code messages for banking transactions); *Hotel Security Checking Co.* v. *Lorraine Co.,* 160 F. 467, 469 (C.A. 2) (restaurant bookkeeping system).

puter to sort check and deposit data into different categories in the conventional way the computer performs such tasks, and then conventionally to print out the results of the sorting operation. Because respondent's idea, like Benson's, "has no substantial practical application except in connection with a digital computer," a patent on respondent's "machine system" would "wholly pre-empt" use of that idea and in "practical effect" be a patent on the idea. *Benson, supra,* 409 U.S. at 71–72.

As Judge Rich suggested in his dissent (App. 19A–20A, *infra*), respondent's claiming as a "machine system" of any and all "means" that will carry out the steps to implement his business idea is as if Benson had claimed, instead of a process, a machine system having means adapted to carry out the steps of the Benson mathematical idea. Even if that kind of description of a process may be a "machine" in a purely linguistic or rhetorical sense, it is not in any pragmatic and realistic sense; it is a "machine" devised by a patent application draftsman, not by a mechanic or artisan. Cf. *Brenner* v. *Manson,* 383 U.S. 519, 534. The only actual machine involved is the familiar general purpose digital computer.

In declaring *Benson* inapplicable simply because respondent's patent claim denominated his idea as a "machine" (while also calling it a "process") (see p. 5, *supra*), the court below elevated form over substance, thereby providing a simple means for circumventing the important principle applied in *Benson.* As in that case, respondent's idea involves, at best, merely a new use for an existing machine, and

that idea should no more be patentable when described as a new "machine system" than when described as a new "process," as in *Benson.*

(C) Even where an idea is not obvious, its implementation must be unobvious as well as to justify the grant of a patent monopoly, whether the implementation involves a process or a product. See, *e.g., Benson, supra,* 409 U.S. at 67–68; *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.,* 333 U.S. 127, 130; *Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.,* 396 F. 2d 70, 73–74 (C.A. 3); *National Lead Co.* v. *Western Lead Prods. Co.,* 324 F. 2d 539, 542 (C.A. 9); *Davison Chem. Corp.* v. *Joliet Chems., Inc.,* 179 F. 2d 793, 794–795 (C.A. 7), certiorari denied, 340 U.S. 816; *Loew's Drive-In Theatres, Inc.* v. *Park-In Theatres, Inc.,* 174 F. 2d 547, 551–552 (C.A. 1), certiorari denied, 338 U.S. 822.

The only elements of novelty associated with respondent's claimed innovation are: first, that a new program is inserted into the old computer, thereby programming the computer to perform a new set of routine steps; and, second, that a new set of meanings is associated with the numerical information being stored in the computer memory (*e.g.,* "rent" for the data concerning some checks, "dividends" for some deposits, etc.). Neither of these elements of novelty, jointly or independently, can turn the old general purpose digital computer underlying the claim here into a "new machine." Respondent's idea would be carried out in a conventional way on a conventional machine, and respondent has not claimed that the implemeta-

tion of his idea is unobvious or patentable.[9] The program implementing respondent's idea co-acts with an ordinary computer in an ordinary way; there is neither "synergism" between the program and the computer (see *Anderson's Black Rock, Inc.* v. *Pavement Salvage Co.,* 396 U.S. 57, 61), nor a newly-invented apparatus that helps carry out the program and with which the claimed monopoly is tied. Accordingly, no invention has been added to or combined with respondent's business idea to transmute it into a patentable process or product.

A new use of an old machine may be patentable as a process if the requirements of the precedents discussed in *Benson* are met (see 409 U.S. at 68–71). But the old machine cannot be claimed anew as a machine. See *Exer-Genie, Inc.* v. *McDonald,* 453 F. 2d 132, 134–135 (C.A. 9), certiorari denied, 405 U.S. 1075; *Old Town Ribbon & Carbon Co.* v. *Columbia Ribbon & Carbon Mfg. Co.,* 159 F. 2d 379, 382 (C.A. 2); cf. *Application of Zierden,* 411 F. 2d 1325, 1328–1329 (C.C.P.A.).

The general purpose digital computer exemplified here, the IBM 1400, is not respondent's creation. When IBM's patents covering this machine expire, their subject matter will fall into the public domain. See, *e.g., Scott Paper Co.* v. *Marcalus Mfg. Co,* 326

[9] The obviousness dispute in this case, over which Chief Judge Markey dissented, concerns the obviousness of the basic idea (see pp. 16–19, *infra*), *not* the means of implementing it.

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U.S. 249, 255–256; *Kellogg Co.* v. *National Biscuit Co.,* 305 U.S. 111, 117. Under the decision of the court below, however, respondent would receive, in effect, a second and further partial monopoly on such machines, which *pro tanto* would withdraw from the public its right of "free access to materials already available." *Graham* v. *John Deere Co.,* 383 U.S. 1, 6; *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co., supra,* 396 U.S. at 61.

2. Alternatively, if the decision of the court below is not viewed as granting a patent on a mere business idea (which constitutes unpatentable subject matter), then it must be regarded as granting a patent covering the computer program required to implement respondent's idea. The grant of a patent on respondent's program, however, would, like the rejected claim in *Benson,* mean patenting a program for conventional use in a digital computer involving no use of new technology. See 409 U.S. at 71. Patents on programs like respondent's thus would cause the very problems cited by the Court in holding in *Benson* that "these programs" are not patentable under current law. 408 U.S. at 72–73.

Accordingly, the decision below creates the uncertainty and risk in this field that *Benson* sought to eliminate.

3. Even if it were assumed that respondent's idea for a new use of a bank's general purpose digital computer involved patentable subject matter, that idea would be "obvious" to one skilled in the art

and therefore unpatentable under 35 U.S.C. 103, contrary to the ruling of the court below.[10]

As the Board observed in rejecting respondent's claim as obvious (App. 34A–35A, *infra*), banks using existing data processing equipment frequently have several accounts for each customer, denominated as "special," "trust," "escrow," "personal," and the like. Each of these terms is comparable to a "category code" as called for by respondent's claims. Although the bank may, for some purposes, regard accounts so denominated as separate accounts of the customer, the bank's treatment of the accounts corresponds to respondent's idea for using category codes. In fact, respondent merely adds the category code to the end of the account number (*e.g.,* R. 281) to create, in effect, a series of differing and distinct account numbers to be used during the automatic data processing. Thus, under a different label, banks already provide a form of cost accounting facility, since the computer's bookkeeping, in handling a customer's separate special accounts, credits and debits the accounts and renders periodic summary statements to the customer. Respondent's printing of the summary sheets for all of a customer's special accounts on a single document, with totals for all accounts, is but an obvious convenience to the customer.

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[10] While the correctness of a ruling by the Court of Customs and Patent Appeals about whether a claimed invention was obvious would not usually warrant review standing alone, we include this among the questions presented in order to place the case before this Court in the full context of the somewhat interrelated issues decided by the court below.

The Board also relied on the Dirks prior art patent, which discloses a comprehensive automatic data processing system for different purposes in individual departments of a large business corporation.[11] His system is especially applicable to ledger-type bookkeeping or mercantile cost accounting, and allows personalized files for localized areas of responsibility. Each area is assigned an account number in which transaction and balance files are kept and updated. The bookkeeping is on a cost accounting basis, such as for sales of a product. Despite any superficial differences between mercantile cost accounting and bank bookkeeping, there is no fundamental difference in the data processing apparatus or methods used in respondent's claimed invention and in Dirks' patented invention. The equipment and methods are necessarily the same, whether the amount debited represents the value of merchandise or the value of a check.[12]

The differences between respondent's idea and the content of the prior art are so slight that it would have been obvious to a person of ordinary skill in devising uses for computers by banks to have banks provide an additional bookkeeping service by using category codes. Accordingly, the Court of Customs and

[11] The claims in the Dirks patent are directed to a particular structure which carries out the system disclosed, however, rather than, as here, only to the concept of the system.

[12] The finding of the court below that the claimed invention here is not the "equivalent" of Dirks' invention may be material in determining whether use of respondent's system would infringe Dirks' patent, but it does not suffice as a determination on the obviousness question and, indeed, indicates that the court below applied an erroneous standard. See also App. 17A, *infra*.

Patent Appeals erred in holding respondent's idea unobvious and thus patentable. See *Graham* v. *John Deere Co., supra*.

CONCLUSION

For the foregoing reasons, the petition for a writ of certiorari should be granted.

Respectfully submitted.

ROBERT H. BORK,
Solicitor General.

THOMAS E. KAUPER,
Assistant Attorney General.

GERALD P. NORTON,
Assistant to the Solictor General.

HOWARD E. SHAPIRO,
RICHARD H. STERN,
Attorneys.

KARL E. BAKKE,
General Counsel,
Department of Commerce.

JOSEPH F. NAKAMURA,
Solicitor,

JERE W. SEARS,
Deputy Solicitor,
United States Patent and
Trademark Office.

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APPENDIX A

Application of Thomas R. Johnston, Patent Appeal No. 9088

United States Court of Customs and Patent Appeals,
Sept. 19, 1974

Applicant appealed from a decision of Patent Office Board of Appeals, Serial No. 624,741, which rejected apparatus claims 20–24 relating to an automatic financial record-keeping system which employs a digital computer. The Court of Customs and Patent Appeals, Baldwin, J., held that the appealed claims were improperly rejected for obviousness and for claiming nonstatutory subject matter and for failure to meet specificity requirements.

Reversed.

Markey, C. J., and Rich, J., dissented and filed opinions.

1. Patents ⇦118.3

Apparatus claims 20–24 relating to an automatic financial record-keeping system which employs a digital computer were in compliance with statutory requirements that subject matter of that which applicant regards as his invention be particularly pointed out. 35 U.S.C.A. § 112.

2. Patents ⇦118.3

Apparatus claims 20–24 relating to an automatic financial record-keeping system which employs a digital computer were not indefinite on theory that they purportedly encompassed a human being as part of the claimed apparatus. 35 U.S.C.A. § 112.

3. Patents ⇦7.14

Apparatus claims 20–24 relating to an automatic financial record-keeping system which employs a digital computer could not be rejected as claiming nonstatutory subject matter on theory that claims were not within the technological arts. 35 U.S.C.A. § 101.

4. Patents ⇦18

In determining whether or not applicant's record-keeping machine system was obvious variation of bookkeeping systems which were acknowledged by applicant to be known in the art, court was required to view prior art without reading into that art teachings of applicant. 35 U.S.C.A. § 103.

5. Patents ⇦18

Apparatus claims 20–24 relating to an automatic financial record-keeping system which employs a digital computer were not invalid for obviousness. 35 U.S.C.A. § 103; U.S.C.A. Const. Art. 1, § 8.

Morton C. Jacobs, Philadelphia, Pa., attorney of record, for appellant, McClure, Millman & Jacobs, Philadelphia, Pa., of counsel.

Joseph F. Nakamura, Washington, D.C., for the Commissioner of Patents, Jere W. Sears, Washington, D.C., of counsel.

Before MARKEY, *Chief Judge*, and RICH, BALDWIN, LANE and MILLER, *Judges*.

BALDWIN, *Judge*.

This appeal is from the decision of the Patent Office Board of Appeals rejecting claims 20–24 [1] of appellant's application.[2]

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[1] The board's decision concerned claims 1–11 and 16–27, but appellant has only appealed the rejection of claims 20–24.

[2] Serial No. 624,741, filed March 21, 1967.

THE INVENTION

Appellant's invention relates to an automatic financial record-keeping system which employs a digital computer. The application states:

> Automatic data processing equipments employing digital computers have been developed for the handling of much of the record-keeping operations involved in a banking system. The checks and deposit slips are automatically processed by forming those items as machine-readable records; that is magnetic ink characters are imprinted on the check, so that magnetic readers are enabled to process these checks and enter the data in a computer system in the form of coded electrical signals. Other character reading machines operating on an optical principle for automatically reading special optical type fonts are also employed. With such machine systems, most of the extensive data handling required in a bank can be performed automatically.
>
> It has been found that such data processing equipment, with certain additions and modifications, can be employed to process automatically much, if not all, of the individual record keeping required by a bank's customers to maintain their own personal and business financial records. That is, as a supplement to the conventional, periodic bank statement furnished to a bank customer, a record summary is provided with [sic] makes unnecessary much or all of the tedious bookkeeping and accounting that the customers would otherwise have to perform.
>
> * * * * *
>
> In accordance with an embodiment of this invention, an automatic record-keeping system is provided which is especially adapted for use with automatic banking devices for machine handling of the transactions (i.e. checks or deposits) of demand-deposit accounts of bank customers. Machine-readable records of each

569-016—75——4

bank transaction are generated directly on the check or the deposit ticket. The data of such records incorporate those required for conventional banking systems presently carried on checks (or deposit tickets); namely, the customer's account number, amount of the transaction, and the type of transaction (that is, whether a check or a deposit). Another set of data forming a machine-readable record is provided on each transaction, namely, a set of code characters that identify the bookkeeping classification of each transaction; this classification code is called the "category number." [e.g., categories indicating different sources of income for which deposits are made and categories indicating different types of expenses for which checks are written.] The category number is entered by the customer on each transaction slip (check or deposit) at the time it is prepared, in the form of a machine-readable record by means of an appropriate device, or in the form of a set of hand-written numeric characters which are converted to a machine-readable record by the customer's bank.

In the customer's bank, upon a deposit being made or a check clearing the bank, the machine-readable transaction records on the imprinted checks or deposit tickets are read by a suitable document-reader device and stored in a transaction file. To process the transaction file, the automatic record-keeping system employs a data processor, such as a programmable electronic digital computer, having certain data storage files and a control system. In addition to the transaction file, a master record-keeping file is used to store all of the records required for each customer in accordance with the customer's own chart of accounts. The latter is individually designed to the customer's needs and also constructed to cooperate with the control system in the processing of the customer's transactions. The control system directs the generation

of periodic output reports for the customer which present the customer's transaction records in accordance with his own chart of accounts and desired accounting procedures.

The control system is described as comprising a general control which is applicable to the processing operations that are common to most customers and a master control for the operations that vary on an individual basis with each customer. The general control, as allegedly reduced to practice, is in the form of a software program and the master control is a series of sub-files, one for each customer, which are in the form of a sequence of records containing suitable control mechanisms and the customer's financial data.

The application contains schematic block and flow diagrams of the entire apparatus including detailed descriptions of each diagram which set forth the interrelationships between all the disclosed elements of the apparatus. The application also discloses a print-out of a complete program and a detailed flow chart thereof for use with a known commercial general-purpose computer, the IBM 1400 series, to provide the special-purpose computer which forms the apparatus of appellant's invention.

Claim 20 is exemplary:

> 20. A record-keeping machine system for financial accounts, said system comprising a data processor including a memory for storing combinatorially coded signal records;
>
> a processor for combining and comparing the coded signals of said records;
>
> input and output devices;
>
> and a control system for supervising and directing said other parts of said data processor to perform a certain sequence of operations;
>
> said memory including a storage file of a plurality of machine-readable records formed of coded combinatorial signals, a master section of said file including a plurality of predeterminedly sequenced sub-files of said records, each said sub-file including a different signal group

record for a certain one of a plurality of account identifications, a plurality of predeterminedly sequenced different signal group records for different record-keeping category codes individually associated with reach of said account identification records, a plurality of different group records each for an amount total associated with a different one of said category records, and a plurality of totalizing operation records individually associated with certain pluralities of said category records and sequenced with the associated category records, a transaction section of said file including different pluralities of sub-files of said records, each of said transaction sub-files including one of said account identification signal group records, one of said associated category signal group records, and a separate transaction amount signal group record associated with each of said category records;

said control system including means for directing the processing of said files in accordance with the predetermined sequences of said master subfiles and of said category records of each sub-file, said processing directing means including means for locating in said master file section, for each of said transaction sub-files, that one of said category records corresponding to the transaction account identification record and the transaction category record and for augmenting the associated master amount total record by the amount records of the corresponding transaction sub-file; and

means for producing an output record for each of said master sub-files;

said output record producing means including means for identifying each of said master sub-file category records and for producing an output listing of the sub-file category codes and of the associated category amount total from said records, means for directing the accumulation of the amount totals of successive ones of

said category records, and means for identifying each of said totalizing records and for producing an output record of said accumulation of totals of the preceding category records. [paragraphing ours].

THE REJECTIONS

The examiner rejected all the claims in appellant's application under 35 U.S.C. § 112 and 35 U.S.C. § 102; however, the board did not consider the underlying bases for these rejections to be valid and did not sustain these rejections.[3] However, under the provisions of Rule 196(b), Rules of Practice in Patent Cases,[4] the board then entered five new rejections under the provisions of 35 U.S.C. § 112, 35 U.S.C. § 101, and 35 U.S.C. § 103.[5]

REJECTIONS UNDER 35 U.S.C. § 112

The board's first rejection of the claims is under the provisions of the second paragraph of § 112 in that the claims fail to particularly point out and distinctly claim that which appellant considers to be his invention.

The board stated:

[3] The board found that the examiner had based his rejections upon the premise "that an unprogrammed, or a differently programmed, general purpose computer is the same machine as the one that would result from appellant's programming of the same or of a similar computer." The board acknowledged that neither it nor this court considers that premise to be valid, obviously referring to In re Bernhart, 417 F. 2d 1395, 57 CCPA 737 (1969).

[4] 196. Decision by Board of Appeals

* * * * *

"(b) Should the Board of Appeals have knowledge of any grounds not involved in the appeal for rejecting any [appealed] claim, it may include in its decision a statement to that effect

[5] The appellant did not seek any reconsideration provided for by Rule 196(b) and appealed directly to this court.

Appellant * * * [in] his specification acknowledges that automatic data processing equipment has already been developed for the financial record-keeping and statement-furnishing operations of a bank so that the rendering of these services merely by some form of automatic data processing, not including appellant's improvements thereover, was not considered to be appellant's invention.

Turning now to the appealed claims, both apparatus and method,[6] we find them not directed to improved record keeping machinery, but rather to a broad system of keeping financial records where the distinction over acknowledged prior record-keeping is either in the identity of the person or institution which has custody of certain phases of the bookkeeping operation or in the financial meaning of, or the relationship existing between, the various records. Thus, the broad sweeping reference in the claims to the automation of the banking industry serves only as a dress for claims that

with its reasons for so holding, which statement shall constitute a rejection of the claims. The appellant may submit an appropriate amendment of the claims so rejected or a showing of facts, or both, and have the matter reconsidered by the primary examiner. The statement shall be binding upon the primary examiner unless an amendment or showing of facts not previously of record be made which, in the opinion of the primary examiner, avoids the additional ground for rejection stated in the decision. The applicant may waive such reconsideration before the primary examiner and have the case reconsidered by the Board of Appeals upon the same record before them. Where request for such reconsideration is made the Board of Appeals shall, if necessary, render a new decision which shall include all grounds upon which a patent is refused. The applicant may waive reconsideration by the Board of Appeals and treat the decision, including the added grounds for rejection given by the Board of Appeals, as a final decision in the case."

[6] The presently appealed claims 20–24 are all apparatus claims.

> spell out, in effect, the relationship of a bank and its customers, not any particular configuration of business machinery.

The board's second rejection under the provisions of § 112, second paragraph, was labeled indefiniteness. The board reasoned that portions of appellant's apparatus are defined as means for identifying an account or type of transaction and that this "identification of the meaning represented by a section of the computer memory is in the mind of the user and cannot define any characteristic of the apparatus." Relying upon the following passage from In re Foster, 438 F.2d 1011, 1015, 58 CCPA 1001, 1006, (1971):

> Judge Baldwin in the second Prater opinion [Application of Prater, 415 F.2d 1393, 56 CCPA 1381 (1969)] made it clear that means-plus-function language such as that used in the present apparatus claims does not encompass the human being as the "means" or any part thereof [,]

the board held the claims to be indefinite insofar as they purportedly encompassed a human being as a part of the claimed apparatus.

REJECTION UNDER 35 U.S.C. § 101

Under the provisions of § 101 the board rejected all the claims as claiming non-statutory subject matter. After reviewing the holdings of prior opinions of this court, *e.g.,* In re Foster, *supra;* and In re Musgrave, 431 F.2d 882, 57 CCPA 1352 (1970), which held that computer related inventions were "statutory" subject matter if they were within the "technological arts," the board inferred that computer related inventions which "extend beyond the field of technology

are not within the 'technological arts' and are non-statutory." After noting that the term " 'technological arts' should [not] embrace processes of using machines so as to dominate practices in the 'liberal arts,' such as social or political sciences, humanities, music and art," the board stated:

> A granting of the instant claims would, in effect, grant a monopoly to appellant on a method of conducting the banking business since banks would thereby be restricted to the use of their data processing equipment only for their own bookkeeping and not being allowed to freely expand into the business of keeping books for their customers.
>
> The granting of claims which would allow the intrusion of the patent system into the social sciences already under regulation by governmental agencies would exceed the constitutional grant of authority to issue patents in the "technological arts."

REJECTIONS UNDER 35 U.S.C. § 103

All the claims were further rejected under the provisions of § 103 as being "obvious variations of either the system of bookkeeping by banks that was acknowledged to be old by appellant * * * [in his] specification[7] or the system of bookkeeping of the Dirks patent[8] when applied to banking rather than industrial business."

The board noted that individual bank customers frequently have plural accounts, such as "trust" or "escrow" accounts, and that the names of these accounts is a "category code" as required by the claims. The

[7] This portion of the specification is reproduced in this opinion under *The Invention* section, *supra*.

[8] U.S. Patent No. 3,343,133, issued September 19, 1967, on an application filed August 9, 1963.

board acknowledged that, although a bank may regard those accounts as separate accounts, its treatment of those accounts is the same as that accorded appellant's different category codes, inasmuch as "the bookkeeping in the separate special accounts of a single customer correctly credits and debits the same and renders periodic summary statements of account to the customer." Therefore, the board opined:

> Merely printing the summary sheets for all the special accounts of an individual on a single document with totals for all accounts would be an obvious convenience to both the bank and the customer.

As to the rejection of the claims as unpatentable over the Dirks patent, the board stated:

> Dirks discloses a comprehensive automatic data processing system for many different purposes in networks of individual departments of a large business corporation * * *. This system allows personalized files for localized areas of responsibility * * *. Each area is assigned an account number in which transaction and balance files are kept and updated * * *. The bookkeeping is on a cost accounting basis * * * such as for sales of a product.
>
> There is no fundamental difference in a data processing apparatus or method because of the nature of the goods involved in a sales transaction. The bookkeeping apparatus and method would be the same no matter whether the amount debited represented the value of the merchandise or the value of the extended credit.
>
> Accordingly, it would have been obvious to a person of ordinary skill to use the cost accounting portion of the Dirks system of bookkeeping in the banking rather than the mercantile business.

OPINION

Considering first the rejections under the second paragraph of § 112, we find the instant apparatus claims to be in compliance with the requirements set forth in that section of the statute. These requirements were recently discussed by this court in In re Knowlton, 481 F. 2d 1357, (Cust. & Pat. App. 1973).

[1] In essence, the "failure to particularly point out and distinctly claim" rejection [9] is based upon the board's conclusion that the "relationship of a bank and its customers, not any particular configuration of business machinery", is being claimed. Upon reading the appealed *apparatus* claims we cannot perceive how any such "relationship" is being claimed. In typical means-plus-function language, which is expressly sanctioned by the third paragraph of § 112, the appealed *apparatus* claims are clearly drawn to a "record-keeping *machine* system for financial accounts" (emphasis added). Accordingly, we cannot sustain the board's rejection on its stated grounds.

[2] The board's rationale underlying its second rejection under § 112 for indefiniteness [10] appears to be the same as that found to be defective in In re Foster, *supra*. Here, as in *Foster*, we find the appealed *apparatus* claims clearly read only upon the subject matter which appellant regards as his invention—a "record-keeping *machine* system for financial accounts" (emphasis added)—not a human being inside or outside appellant's apparatus. Appellant's specification makes it quite clear that the claimed *apparatus* automatically performs the identifying operations referred to by the board; those operations are neither actually performed by a human being, nor can we imagine how they could be realistically performed by a human being. See In re Bernhart, *supra*. Thus, we cannot sustain this rejection on the board's stated rationale.[11]

[3] With regard to the rejection under § 101, we cannot agree with the board that the apparatus of the appealed claims is not within the "technological arts." [12] Record-keeping *machine* systems are clearly within the "technological arts." Such *machine* systems, which comprise programmed digital computers, are statutory subject matter under the provisions of § 101, and "claims defining them must be judged for patentability in light of the prior art." In re Bernhart, *supra*. Furthermore, we are not aware of, nor can we

[9] We note that although the "failure to distinctly claim" language used in the board's rejection connotes a rejection for indefiniteness, In re Knowlton, *supra*, the sole basis for its rejection was that appellant was claiming something—a relationship between a bank and its customer—other than what appellant regarded as his invention, *i.e.*, a failure to particularly point out the subject matter which appellant regards as his invention. Accordingly, we treat the rejection on this basis.

[10] Although the board held the claims to be indefinite, we again find the sole basis of the rejection was that appellant was claiming something—a human being—other than what appellant regarded as his invention. Thus, we also treat this rejection on this basis.

[11] The solicitor argues that the board had another basis for its indefiniteness rejection, namely that the means-plus-function recitations in the claims are indefinite for lack of any corresponding descriptions of structure in the specification upon which the scope of equivalents might be based in accordance with the third paragraph of § 112.

However, we cannot agree with the solicitor that the board set forth any such basis for its "indefiniteness" rejection. Furthermore, the thrust of this proposed rejection indicates that it would have been properly made under the *first* paragraph of § 112. See In re Comstock, 481 F.2d 905, (Cust. & Pat. App. 1973), In re Knowlton, *supra*. See *also* In re Bernhart, *supra*.

[12] "The phrase 'technological arts,' * * * is synonymous with the phrase 'useful arts' as it appears in Article I, Section 8 of the Constitution." In re Waldbaum, 59 CCPA 940, 457 F. 2d 997 (1972).

locate, any dictionary which would define a *machine* system as within the purview of the "liberal arts." [13]

The board's reluctance to "grant a monopoly to appellant on a method of conducting the banking business" is misplaced. The appealed apparatus claims are not drawn to cover either a method of doing business or even a method of bookkeeping. Nor would banks "be restricted to the use of their data processing equipment only for their own bookkeeping and not * * * [be] allowed to freely expand into the business of keeping books for their customers." Obviously, banks would be free to so expand their services and use any apparatus they may desire *except* the apparatus set forth in appellant's claims. We do not find that situation to be in conflict with Article I, Section 8, of the Constitution, since the "right to exclude others" is the very heart of our patent system.

Additionally, the solicitor argues that the holding in the recent opinion of the Supreme Court in Gottschalk v. Benson, 409 U.S. 63, 93 S. Ct. 253, 34 L. Ed. 2d 273 (1972) is logically applicable to the instant apparatus claims. However, as we stated in In re Christensen, 478 F. 2d 1392 (Cust. & Pat. App. 1973):

> The issue considered by the Supreme Court in *Benson* was a narrow one, namely, is a formula for converting binary coded decimal numerals into pure binary numerals by a series of mathematical calculations a patentable *process*? (emphasis added).

Furthermore, the instant claims in *apparatus* form, do not claim or encompass a law of nature, a mathematical formula, or an algorithm. For these reasons, we do not find the holding of *Benson* to be applicable to claims of the type now before us.

[13] We likewise do not agree with the board that banking is a "social science."

[4] Finally, we reach the rejections under § 103. In determining whether or not appellant's record-keeping machine system is an obvious variation of the bookkeeping systems which were acknowledged by appellant to be known in the art, "we must view the prior art without reading into that art appellant's teachings." In re Sponnoble, 405 F. 2d 578, 56 CCPA 823 (1969).

[5] We cannot agree with the board that the claimed "category codes" are equivalent to the account numbers of separate accounts that a customer may have with one bank. Appellant's "category codes" and account numbers [14] are two different types of controls, as appellant's specification and claims clearly point out. Furthermore, appellant's claimed invention produces a breakdown of a customer's income and expenditures associated with a *single* account and is not directed to the board's proposed modification of known data processing apparatus to provide a customer with merely a summary sheet consisting of net totals of plural separate accounts which a customer may have at a bank. Although it may possibly be obvious to modify known record-keeping apparatus to achieve a summary sheet of a plurality of separate accounts, as proposed by the board, we conclude that any further modification to such known apparatus, in order to achieve the results of appellant's claimed apparatus, would not have been obvious to one of ordinary skill in the art who did not have appellant's specification before him.

Turning to the obviousness rejection based upon the patent to Dirks, we conclude that this reference does not render the subject matter of the appealed claims obvious to one of ordinary skill in the art. The

[14] Claim 20 uses the terminology "account identifications" for account numbers.

four brief portions of the Dirks specification [15] referred to by the board and the additional passages of that specification called to our attention by the solicitor simply are not suggestive of the subject matter of the appealed claims. We find that, with appellant's specification before them, the board and solicitor have merely chosen various portions of the Dirks apparatus and have attempted to read them upon various elements set forth in appellant's claims. Furthermore, we note that the solicitor's interpretation of Dirk's apparatus creates substantially the same apparatus as that of the board's proposed modification of known data processing apparatus, *supra,* insofar as the solicitor interprets various *separate* accounts of Dirks as corresponding to appellant's claimed category codes. Accordingly, we cannot sustain this rejection.

For the foregoing reasons, the decision of the Patent Office Board of Appeals is reversed.

Reversed.

MARKEY, *Chief Judge* (dissenting).

I would affirm the decision of the board on its rejection under 35 U.S.C. 103. In that event, discussion of the rejections under 35 U.S.C. 112 and 101 becomes unnecessary. That we decline to discuss rejections which are thus rendered moot does not, of course, reflect in any way upon the validity or invalidity of such rejections.

The majority opinion finds differences between the claimed subject matter and the prior bank data processing system. Thereupon, the majority opinion appears to treat the obviousness rejection below as though it were based on 35 U.S.C. 102. There is no doubt, as the board recognized, that appellant's pro-

[15] We note that the Dirks patent comprised 509 pages of the instant Record.

grammed computer differs from the conventional programmed computers previously employed in banks. But the question under 35 U.S.C. 103 is whether appellant's programmed computers as claimed, i.e., his "record-keeping machine system," would have been obvious to those skilled in the art applicable to such record-keeping machine systems. In my view one skilled in the art, presented with the conventional machine system, would have found it obvious, without knowledge of appellant's disclosure, to have modified the system as set forth in the appealed claims.

Similarly, I regard the differences between the claimed subject matter and the relevant portions of the Dirks' patent to be such as to have rendered obvious the claimed subject matter as a whole at the time the invention was made. That only portions of the Dirks' specification are relied on by the board is of course, irrelevant if such portions do in fact render obvious the subject matter of the appealed claims. Whether or not Dirks discloses category codes or their equivalent would not appear to be the question. If it did, the rejection might well be under 35 U.S.C. 102. The question is whether the contribution of such category codes by appellant is a difference sufficient to render the claimed subject matter unobvious to one skilled in the applicable art. As above indicated, I differ from my brothers in the majority and would answer that question in the negative.

Thus, I find no clear error on the part of the board in its rejection of the appealed claims under 35 U.S.C. 103. In the absence of such clear error we must, and I would, affirm the decision of the board.

RICH, *Judge* (dissenting).

On the authority of Gottschalk v. Benson, 409 U.S. 63, 175 USPQ 673 (1972), I would affirm the rejection of the claims on appeal which was made by the board

under § 101, as requested by the Solicitor for the Patent Office.

The board's rejection was in these words:

> Under the provisions of Rule 196(b) this board herewith enters under 35 U.S.C. 101 a further rejection of claims 1 through 11 and 16 through 27 as for subject matter outside the patent statutes.

This is inclusive of claims 20–24 on appeal here. The board did not, of course, have the benefit of the Supreme Court's views in *Benson* because the board decision was on October 27, 1971, and *Benson* was not decided by the Supreme Court until November 20, 1972.

The Supreme Court held the process claims in *Benson* unpatentable under § 101. As the solicitor points out, appellant, in his main brief, ignored the Supreme Court *Benson* decision. In his reply brief he endeavors to deal with it—unsuccessfully, in my view. He attempts to distinguish on the ground that the claims here are directed to machines while *Benson* involved process claims. I think that will not suffice. Appellant has to concede that

> * * * the only resemblance of this case to *Benson* is that of the use of computer programs to embody the invention. Therein lies the rub, for appellee [the Patent Office] would deny patents for all software-embodied inventions.

The board, which was dealing with claims of appellant cast in both process and machine form, said the following, with which I agree:

> We see no essential difference in substance between these apparatus claims which define only broad means for performance of the steps of a data processing method and process claims 25, 26 and 27 which define the steps of the data processing method as being carried out by any conventional data processing machine. Hence, *we consider that both the apparatus and the method claims on appeal must stand or fall together.* [Emphasis added.]

I realize that claims 25, 26, and 27 are not on appeal but I do not take the board's comment as being restricted to them among the process claims. The point is that the machine or apparatus and process claims are really directed to the same invention, of which appellant's main brief says:

> * * * this invention is being sold as a computer program to banks and to other data processing companies so that they can perform these data processing services for depositors.

What could more clearly reveal the reality that the invention is a program—software—and that that is what appellant wants to protect by the appealed "machine system" claims? Appellant did not invent a machine—i.e., "hardware." Appellant's brief further states:

> This machine was reduced to practice in the software form of computer programs * * *.

I am quite familiar with the legal doctrine that a new program makes an old general purpose digital computer into a new and different machine. This court has been through that many times and I am not denying the validity of this principle—which partakes of the nature of a legal fiction when it comes to drafting claims. My problem is that, knowing the *invention* to be a new program, I must decide whether it is patentable in any claimed form in view of *Benson,* whether claimed as a machine, a "machine system," or otherwise. I am probably as much—if not more—confused by the wording of the *Benson* opinion as many others. What the Court *did* in its *decision* reversing the hold-

ing of this court that Benson and Tabbot's method claims were patentable subject matter under § 101 contains a message that is loud and clear. If those claims are not to patentable subject matter, neither, in my view, are the claims here, regardless of difference in form. Benson et al. had a program invention too and they could have cast their claims in machine system form just as appellant did. Every competent patent draftsman knows how to do that.

It seems to me important to focus on what the Supreme Court did in *Benson,* rather than on the specifics of its explanation of why it did. I have no idea what was in the collective mind of the six-justice Court in approving the statements:

> It is said that the decision precludes a patent for any program servicing a computer. We do not so hold. * * * It is said we freeze process patents to old technologies, leaving no room for the revelations of the new, onrushing technology. Such is not our purpose.

These are the comforting words to which some inventors of software and owners of software inventions look for solace. I find it more significant to contemplate the identities of the troops lined up for battle in *Benson* and observe which side obtained the victory. On the one side was the Government, against patenting programs or software, supported by the collective forces of major hardware (i.e., computer) manufacturers and their representative associations who, for economic reasons, did not want patents granted *on programs* for their machines. On the other side was Benson et al. and their assignee and assorted lawyers and legal groups who were in favor of patent protection for programs or software. The anti-patenting forces won the victory—if not an altogether clear one—and on the legal principle that the Benson et al. way of

programming a computer to do a particularly useful job of general applicability in the data processing field was the kind of invention the Supreme Court would not approve patenting without prior consideration by and specific authorization from the Congress. The major part of the rather brief and now famous "nut-shell" conclusion of the Court's opinion dwells heavily on this point.

I can find no realistic distinction in kind between the Benson et al. invention and the invention here and I conclude that the *Benson* decision requires us to affirm the rejection of claims 20–24 as directed to non-patentable subject matter under 35 U.S.C. 101. Holding that view, I find it unnecessary to consider the remaining four grounds of rejection discussed by my colleagues.

It has been suggested that the position I am taking is inconsistent with the position I have taken or the views I have expressed in others of the many carefully reasoned opinions of this court on the statutory subject matter question under 35 U.S.C. 101 which led to *Benson,* none of which was discussed or even recognized in the Supreme Court's *Benson* opinion. As a result, the value of those opinions as precedents has become unsettled.

It may well be that I seem to have been inconsistent. As the author of the opinion of this court in *Benson,* which was wholly reversed, I have not been persuaded by anything the Supreme Court said that we made a "wrong" decision and I therefore do not agree with the Supreme Court's decision. But that is entirely beside the point. Under our judicial system, it is the duty of a judge of a lower court to try to follow in spirit decisions of the Supreme Court—that is to say their "thrust." I do not deem it to be my province as a judge to assume an advocate's role and argue the right-

ness or wrongness of what the Court has decided or to participate in what I regard as the inconsistent decision here, supported by a bare majority which tries in vain, and only briefly, to distinguish *Benson* by discussing form rather than substance and various irrelevancies like pre-*Benson* decisions of this court, the banking business, social science, and the liberal arts. I deem it to be the Supreme Court's prerogative to set the limits on *Benson,* which was broadly based. I hope it will do so. As John W. Davis, erstwhile outstanding Solicitor General, once said, "The first requirement of any judicial opinion is utter clarity." [16]

[16] Harbaugh, Lawyer's Lawyer, The Life of John W. Davis, Oxford University Press, New York (1973), p. 108.

APPENDIX B

United States Court of Customs and Patent Appeals

Mandate No. 9088

In the Matter of the Application of Thomas R. Johnston. Serial No. 624,741

On Appeals from the Board of Appeals

This Cause having been heard and considered, it is ORDERED AND ADJUDGED: reversed.

Dated: September 19, 1974.

GEORGE E. HUTCHINSON,
Clerk, United States Court Customs and Patent Appeals.

A true copy Test:

Certified this 11th day of October 1974,

By: GEORGE E. HUTCHINSON

Docket Entry

October 11, 1974. Final Mandate issued to Commissioner of Patents.

APPENDIX C

Decision of Board of Appeals

October 27, 1971

EX PARTE THOMAS R. JOHNSTON

Application for Patent filed March 21, 1967, Serial No. 624,741. Machine System for Automatic Record Keeping of Bank Checks and Deposits

Before MAGIL, ANDREWS and STRADER, Examiners-in-Chief. ANDREWS, Examiner-in-Chief:

This is an appeal from the final rejection of claims 1 through 11 and 16 through 27. Claims 12 through 15 were withdrawn by the examiner from prosecution as the result of a requirement for election. No claim has been allowed.

Illustrative claim 1 is reproduced as follows:

> 1. A banking and record-keeping machine system for demand-deposit banking accounts, said system comprising a data processor including a memory for storing combinatorially coded signal records; a processor for combining and comparing the coded signals of said records; input and output devices; and a control system for supervising and directing said other parts of said data processor to perform a certain sequence of operations;
> said memory including a storage file of a plurality of said records, a first master section of said file containing a plurality of sub-files of said records predeterminedly arranged, each of said sub-files having a record identifying a different demand-deposit account number and identifying the balance of the corresponding

demand-deposit account, a second master section of said file containing a plurality of sub-files of said records each respectively associated with a different one of said account numbers and a plurality of records identifying record-keeping category codes and transaction totals respectively associated with said category codes, a transaction section of said file containing a plurality of records each identifying a transaction for a particular one of said accounts and for an associated category code and the amount thereof;
said input devices including means for supplying a plurality of machine-readable transaction records to said memory, each of said input records including means for identifying a particular one of said accounts and the amount and type of a transaction; said control system including means for directing the posting to said first master file section of successive ones of said input transaction records to modify the associated account balances in accordance therewith and for directing the updating of said transaction file section in accordance therewith, means for directing the generation at certain time periods of an individual output report for each account presenting the current balance thereof stored in said first master file section and the total amounts of transactions for each period, and means for directing the updating of said category totals of said second master sub-files in accordance with the records of said transaction file section and for directing the generation of another individual output report for each account at certain periods made up of said updated category totals.

The examiner relied on the following references:

Hopper et al.	3,274,554	Sept. 20, 1966
Tink et al.	3,308,439	Mar. 7, 1967
Dirks	3,343,133	Sept. 19, 1967
Best et al.	3,374,462	Mar. 19, 1968
Looschen et al.	3,407,387	Oct. 22, 1968

The invention pertains to a system for conducting a banking business in which the bank offers to its demand deposit (checking) account customers an individual bookkeeping service that allows a categorization of each credit or debit transaction by each customer. In addition to the periodic rebalancing of the customer's account for the internal use of the bank in honoring checks drawn on the account, the bank keeps records of the individual transactions and periodically renders a statement listing each transaction and stating the balance of the account. Also periodically the bank renders another statement to each customer listing the transactions under each category with its total and balance.

Appellant proposes to use a central programmed, general purpose, electronic computer to mechanically process the data so as to carry out the individual's, as well as the bank's bookkeeping systems. Although the application discloses that which purports to be a detailed machine readable program for a computer that is identified by its trade name, the details thereof are not brought into issue in this appeal by reason of the character of the claims presented, which are either to a method of bookkeeping that broadly utilizes automatic bookkeeping machinery of any character or to apparatus that automatically carries out, by any form of mechanism, the steps of the bookkeeping method.

Claims 1 through 8, 10, 11 and 16 through 24 have been rejected under 35 U.S.C. 112 but claim 9, which depends on claim 8, was neither included nor excluded from the rejection on this section of the statute. Since the rejection clearly is as applicable to claim 9 as to its parent claim and since appellant in his brief so treats this claim, we shall likewise construe the examiner's rejection as being applied to claims 1 through 11 and 16 through 24.

Claims 1 through 11 and 16 through 24 stand rejected under 35 U.S.C. 112, presumably the second paragraph thereof, for failure to particularly point out and distinctly claim the subject matter which appellant considers to be his invention and under 35 U.S.C. 112, presumably the third paragraph thereof, as claiming the use of a known machine in "means-plus-function" language.

Claims 1 through 11 and 16 through 24 stand further rejected under 35 U.S.C. 102 as fully anticipated by the apparatus of anyone of Hopper et al., Tink et al., Dirks or Best et al., and claims 25 through 27 stand further rejected as fully anticipated by the method of either Tink et al. or Looschen et al.

This board considers the issues raised by the two separate rejections under 35 U.S.C. 112 and the two rejections under 35 U.S.C. 102 so interrelated that they should be considered together. The bases for these rejections appear to be the premise by the examiner that an unprogrammed, or a differently programmed, general purpose computer is the same machine as the one that would result from appellant's programming of the same or of a similar computer.

Since neither the Court of Customs and Patent Appeals nor this board considers this premise to be valid, each of the rejections advanced by the examiner is not sustained.

NEW REJECTION

Under the provisions of Rule 196(b) this board enters the following new rejection:

Claims 1 through 11 and 16 through 27 are rejected herewith under 35 U.S.C. 112, second paragraph, as failing to point out and distinctly claim that which appellant considers to be his invention.

Page 3, first paragraph, of appellant's specification states:

> "Accordingly, it is among the objects of this invention to provide a new and improved machine system for automatic record keeping."

Appellant on page 2 of his specification acknowledges that automatic data processing equipment has already been developed for the financial record-keeping and statement-furnishing operations of a bank so that the rendering of these services merely by some form of automatic data processing, not including appellant's improvements thereover, was not considered to be appellant's invention.

Turning now to the appealed claims, both apparatus and method, we find them not directed to improved record keeping machinery, but rather to a broad system of keeping financial records where the distinction over acknowledged prior record-keeping is either in the identity of the person or institution which has custody of certain phases of the bookkeeping operation or in the financial meaning of, or the relationship existing between, the various records. Thus, the broad sweeping reference in the claims to the automation of the banking industry serves only as a dress for claims that spell out, in effect, the relationship of a bank and its customers, not any particular configuration of business machinery.

Under the provisions of Rule 196(b) claims 1 through 11 and 16 through 27 are further rejected herewith under 35 U.S.C. 112, second paragraph, for indefiniteness in failing to distinctly point out the invention.

Each of the claims on appeal, both method and apparatus, purports to identify record storing portions of the apparatus or method steps, only by the particular financial meaning to be accorded this data. This

meaning in no way can define either the construction of the data storing apparatus or the machine processing steps thereof.

There can be no structural or operational relationship of a computer memory with the meaning one chooses to assign outside the computer to a particular configuration of binary digits or "bits" in its memory. Although a group of such bits is processed as an alphanumeric character within the computer this results from the physical states of the memory cells and manifestly this is unrelated to whether a series of such characters represents a stock number of a part or a sum of money, outside the computer. A computer operating with any given stored program is not a different machine simply because one chooses to denominate a section of its memory by a term descriptive of one meaning, such as a file of stock numbers rather than a file of sums of money.

In the appealed claims certain of appellant's disclosed apparatus are defined only as a "means for identifying" an "account," an "amount," or a "type of transaction." The only identification of the meaning represented by a section of the computer memory is in the mind of the user and cannot define any characteristic of the apparatus.

In *In Re* Foster et al., 169 USPQ 99, at 101, the court stated:

> Judge Baldwin in the second Prater opinion made it clear that means-plus-function language such as that used in the present apparatus claims does not encompass the human being as the "means" or any part thereof.

Since appellant purports to embrace by his claims, as a part of the apparatus included in his apparatus claims or as a part of the apparatus steps of his method claims, that which now has been held to be outside the

scope of apparatus, these claims are thereby indefinite under 35 U.S.C. 112.

Under the provisions of Rule 196(b) this board herewith enters under 35 U.S.C. 101 a further rejection of claims 1 through 11 and 16 through 27 as for subject matter outside the patent statutes.

In re Musgrave, 57 CCPA 1352, 431 F. 2d 882, 167 USPQ 280; *In re* Foster et al., *supra; In re* Benson et al., 169 USPQ 548, all found that certain data processing computer systems were within the patent statutes if they were in the "technological arts."

At least by implication, those systems which do extend beyond the field of technology are not within the "technological arts" and are non-statutory.

These cases, although introducing the term "technological arts" into the consideration of what is, or is not, statutory subject matter for a patent shed little light on what is comprehended by that term.

Musgrave held that processing of data for correcting seismograms was in the "technological arts," not withstanding the charge by a minority of the court of the legal problems in interpreting the meaning of this term which was undefined by the majority.

Foster et al. adopted the holding in Musgrave without further indication of what is a "technological art."

Benson et al. ruled that computing machines as well as other types of "business machines" to be in the "technological field" and that processes that enhance the internal operations of such machines to be in the "technological or useful arts." This decision indicates that "liberal arts" are to be excluded from the "useful arts" and, hence, innovations directed thereto are non-statutory.

A dictionary definition of "technological" is found to be "* * * improvement in technical processes that

increase the productivity of machines and eliminate manual operations."

From this, we conclude that "technological arts" include machines or improvements thereof that replace manual effort as well as processes for using or operating those machines which enhance or increase machine productivity.

We find no support for the conclusion that "technological arts" should embrace processes of using machines so as to dominate practices in the "liberal arts," such as social or political sciences, humanities, music and art. The use of machines merely as a conduit or channel for expressing creative effort in the "liberal arts," with no concern for the enhancement of the internal functioning of the machine, goes beyond the "technological arts." Such uses of machines outside the "technological arts" would include recording a political speech via sound motion pictures, printing a literary work by a paper tape controlled typewriter, transcribing by way of magnetic tape an original musical composition, weaving an original textile design on a pattern controlled Jacquard loom or programming a general purpose computer to make the strategic moves in a game of chess or predict the outcome of an election or the activity of the stock market.

In each of these, the machine that is employed operates exactly as it was constructed and without any consideration for any enhancement of the machine but literally, of course, such machines have never been so used before and, hence, the use is novel within the language of 35 U.S.C. 101 and is as unobvious under section 103 as are the political, literary, musical, artistic or strategic concepts presented to the machines. Granting a patent on such uses of a machine, even though both novel and unobvious would

be granting a monopoly outside the "technological arts."

On page 2 of the instant specification it is acknowledged that the keeping of financial records of banks has been done with automatic data processing equipment employing digital computers and that the bank's customers customarily have and maintain their own bookkeeping and accounting systems.

The claims on appeal simply specify that the bank will perform the bookkeeping and accounting services for its customers, rather than each customer performing his own.

Although the format of many of the appealed claims expresses the invention in apparatus form as a conventional data processor that has a number of data files, each file is identified only as to its role in the bookkeeping and accounting system, in association with "means" for performing conventional bookkeeping and accounting operations on the data files. All of this is without regard to the particular apparatus used to perform these operations and certainly with no "enhancement" of the machine operation spelled out. We see no essential difference in substance between these apparatus claims which define only broad means for performance of the steps of a data processing method and process claims 25, 26 and 27 which define the steps of the data processing method as being carried out by any conventional data processing machine. Hence, we consider that both the apparatus and the method claims on appeal must stand or fall together.

A granting of the instant claims would, in effect, grant a monopoly to appellant on a method of conducting the banking business since banks would thereby be restricted to the use of their data processing equipment only for their own bookeeping and not

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being allowed to freely expand into the business of keeping books for their customers.

The granting of claims which would allow the intrusion of the patent system into the social sciences already under regulation by governmental agencies would exceed the constitutional grant of authority to issue patents in the "technological arts."

Under the provisions of Rule 196(b) claims 1 through 11 and 16 through 27 are herewith rejected under 35 U.S.C. 103 as for obvious variations of either the system of bookkeeping by banks that was acknowledged to be old by appellant on page 2 of the specification or the system of bookkeeping of the Dirks patent when applied to banking rather than industrial business.

As is well known, demand-deposit customers of a bank using prior art data processing equipment as described by appellant at page 2 of his specification, frequently have plural accounts for one individual customer. These accounts are frequently denominated as "special," "trust," "escrow," "personal" and the like. Each of these terms is a "category code" as called for by the appealed claims. Although the bank may, for some purposes, regard these accounts so denominated as separate accounts, the bank's treatment thereof is no different than appellant accords the different category codes. In fact, appellant in his treatment merely adds the category number to the end of the account number to create, in effect, a series of different and distinct account numbers to be used during most of his automatic data processing. Thus, under a different label banks already provide its customers with a form of cost accounting facilities since the bookkeeping in the separate special accounts of a single customer correctly credits and debits the same and renders periodic summary statements of account

to the customer. Merely printing the summary sheets for all the special accounts of an individual on a single document with totals for all accounts would be an obvious convenience to both the bank and the customer.

Dirks discloses a comprehensive automatic data processing system for many different purposes in networks of individual departments of a large business corporation (column 6, line 35). This system allows personalized files for localized areas of responsibility (column 7, line 40). Each area is assigned an account number in which transaction and balance files are kept and updated (column 9, lines 21–64). The bookkeeping is on a cost accounting basis (column 18, line 62) such as for sales of a product.

There is no fundamental difference in a data processing apparatus or method because of the nature of the goods involved in a sales transaction. The bookkeeping apparatus and method would be the same no matter whether the amount debited represented the value of the merchandise or the value of the extended credit.

Accordingly, it would have been obvious to a person of ordinary skill to use the cost accounting portion of the Dirks system of bookkeeping in the banking rather than the mercantile business.

The rejection of claims 1 through 11 and 16 through 27 is reversed and new rejections under Rule 196(b) of claims 1 through 11 and 16 through 27 have been entered.

Any request for rehearing or reconsideration or modification of this decision by the Board of Appeals based upon the same record must be filed within thirty days from the date of the decision. (Rule 197). Should appellant elect to have further prosecution before the examiner in response to the new rejection under Rule

196(b) by way of amendment or showing of facts, or both, not previously of record, a shortened statutory period for making such response is hereby set to expire *thirty days* from the date of this decision.

APPENDIX D

Claim 8 in *Gottschalk* v. *Benson,* 409 U.S. 63, 73–74, Revised to Read as a Machine System [1]

[The method of] *A machine system for* converting signals from binary coded decimal form into binary which comprises [the steps of]

(1) *a reentrant shift register for* storing the binary coded decimal signals [in a reentrant shift register],

(2) *Means for* shifting the signals to the right by at least three places, until there is a binary "1" in the second position of said register,

(3) *means for* masking out binary "1" in said second position of said register,

(4) *means for* adding a binary "1" to the first position of said register,

(5) *means for* shifting the signals to the left by two positions,

(6) *means for* adding a "1" to said first position, and

(7) *means for* shifting the signals to the right by at least three positions in preparation for a succeeding binary "1" in the second position of said register.

[1] Words added are in italics; deleted words are in brackets.

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IN THE

Supreme Court of the United States

OCTOBER TERM 1974

No. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS & TRADEMARKS,

Petitioner,

v.

THOMAS R. JOHNSTON,

Respondent.

On Petition for Writ of Certiorari to the United States Court of Customs and Patent Appeals

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MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE AND BRIEF AMICUS CURIAE FOR THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

JOHN S. VOORHEES
KENNETH E. KROSIN
RICHARD A. KLEINE
1730 Pennsylvania Avenue, N.W
Washington, D.C. 20006
Counsel for
Computer & Business Equipment
Manufacturers Association
(CBEMA),
Amicus Curiae

Of Counsel:

HOWREY, SIMON, BAKER
& MURCHISON
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

WILSON - EPES PRINTING CO., INC. - RE 7-6002 - WASHINGTON, D. C. 20001

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MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

The Computer & Business Equipment Manufacturers Association (CBEMA) respectfully moves for leave to file the attached Brief Amicus Curiae in the above-entitled case. Petitioner has consented to the filing of this brief. The consent of respondent was requested but refused.

CBEMA is the trade association which along with its predecessor association, the Business Equipment Manufacturers Association, has represented the computer and

business equipment industry for the past 59 years. The companies comprising the current CBEMA membership include the nation's leading manufacturers of computers and computer-related equipment. While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical character readers, addressing machines, accounting machines, bookkeeping machines and office copying machines. The extent to which such equipment can be utilized effectively depends in great measure on the applications and systems programs developed by computer programmers to control the operations of these machines. CBEMA is also the approved sponsor under the American National Standards Institute (formerly the American Standards Association) for the establishment of domestic and international standards related to information processing, computers and office machines.

The members of CBEMA who manufacture computer products have consistently been forerunners in achieving major developments, in both the concept and application, of computer programming and data processing, and have contributed greatly to the present significant status and role of the computer in modern society. These members maintain and support extensive activities devoted to applied research and systems development in all phases of computer use and data and information processing.

Not only is the subject matter of the present suit of vital concern to the CBEMA membership, and to non-CBEMA members in the comptuer and data processing field, it is also of vital concern to the Government and to the public generally. The final outcome of the issues squarely presented in this case will have a significant influence upon both the immediate and the future planning of CBEMA members with respect to ways and means of

protecting the proprietary fruits resulting from computer program research and development. Thus, the outcome of the present case will inevitably affect the future growth and development of the data processing industry in the United States and will have a corresponding or greater impact on the vast segments of our society which use and receive the benefits of technological advances in this industry.

The attached Brief Amicus Curiae presents together two important and closely related aspects of this case which were not fully treated in the Solicitor General's petition:

(1) The critical confusion caused by the decision of the Court below in the wake of this Court's decision in *Gottschalk* v. *Benson*, 409 U.S. 63 (1972); and

(2) The resulting economic impact of major proportions upon the public, the computer industry, and computer users, including the Government.

Accordingly, CBEMA respectfully requests that this Court grant leave to file the attached Brief Amicus Curiae.

Respectfully submitted,

JOHN S. VOORHEES
KENNETH E. KROSIN
RICHARD A. KLEINE
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006
Counsel for
Computer & Business Equipment
Manufacturers Association
(CBEMA),
Amicus Curiae

Of Counsel:
HOWREY, SIMON, BAKER
& MURCHISON
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

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BRIEF AMICUS CURIAE FOR THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

I

QUESTION PRESENTED

Whether an existing general purpose computer programmed to perform a financial accounting function comprises subject matter which may be patented under 35 U.S.C. § 101 when claimed as a "machine system" for financial accounts.

II

INTEREST OF THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION

This Brief Amicus Curiae is submitted by the Computer & Business Equipment Manufacturers Association (CBEMA) in accordance with Rule 42(1) of this Court. Petitioner has consented to the filing of this brief. The consent of respondent was requested but refused.

CBEMA is the trade association which along with its predecessor association, the Business Equipment Manufacturers Association, has represented the computer and business equipment industry for the past 59 years. The companies comprising the current CBEMA membership include the nation's leading manufacturers of computers and computer-related equipment. While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical character readers, addressing machines, accounting machines, bookkeeping machines and office copying machines. The extent to which such equipment can be utilized effectively depends in great measure on the applications and systems programs developed by computer programmers to control the operations of these machines. CBEMA is also the approved sponsor under the American National Standards Institute (formerly the American Standards Association) for the establishment of domestic and international standards related to information processing, computers and office machines.

The members of CBEMA who manufacture computer products have consistently been forerunners in achieving major developments, in both the concept and application,

of computer programming and data processing, and have contributed greatly to the present significant status and role of the computer in modern society. These members maintain and support extensive activities devoted to applied research and systems development in all phases of computer use and data and information processing.

Not only is the subject matter of the present case of vital concern to CBEMA members and non-CBEMA members in the computer and data processing field, it is also of vital concern to users of computer equipment, including the Government, and the public generally. The final resolution of the issues presented in this case will have a significant influence upon both the immediate and the future planning of CBEMA members with respect to ways and means of protecting the proprietary fruits resulting from computer program research and development. Thus, the outcome of the present case will inevitably affect the future growth and development of the data processing industry in the United States and will have a corresponding or greater impact on the vast segments of our society which use and receive the benefits of technological advances in the industry.

III

REASONS FOR GRANTING THE WRIT

A. The decision of the Court below has created substantial confusion in the wake of this Court's decision in *Gottschalk* v. *Benson*.

In *Gottschalk* v. *Benson*, 409 U.S. 63 (1972), this Court held that a mathematical process embodied in a computer program for use in a general purpose digital computer was not a patentable process within the meaning of 35 U.S.C. § 100(b). In the decision below the Court of Customs and Patent Appeals held that a pro-

grammed general purpose computer claimed as a new "machine system" constitutes patentable subject matter under 35 U.S.C. § 101. However, it is not clear whether the decision below is limited to an interpretation that such a "machine system" is patentable technological art, or an interpretation which enables a patent draftsman to circumvent this Court's holding in *Gottschalk* v. *Benson*. As explained by Judge Rich in his dissenting opinion below, every competent patent draftsman can write process claims in machine system form. Thus, if the lower Court decision stands without clarification, it would appear that patent applicants will be able to obtain patents to machine systems that encompass computer programs simply by drafting claims in the form of such machine systems.

The possibility that this Court's holding in *Gottschalk* v. *Benson* can be obviated by routine claim drafting techniques can only lead to substantial confusion. On the one hand, the decision below holds that machine system claims encompassing computer programs satisfy the requirements for patentability. On the other hand, in keeping with Judge Rich's dissent below, it can be argued that this Court's holding in *Gottschalk* v. *Benson* would be undermined simply by making semantic changes.

B. A final resolution of this case is necessary because it will have a significant economic impact upon the public, the computer industry, and computer users, including the Government.

The confusion and uncertainty created by the decision below in light of *Gottschalk* v. *Benson* will have an economic impact of major proportions that further amplifies the necessity for clarification by this Court. The areas in which the economic impact will be most strongly felt are as follows:

(1) *With Respect to Inventors*: Should the Solicitor General's petition for a writ of certiorari be denied, inventors of computer programs will have to determine whether or not to invest significant human and tangible resources to prepare and prosecute "machine system" patent applications. Situations will arise where a prior inventor refrains from filing such a patent application because of the uncertainty and confusion caused by the holding of the Court below and subsequent inventors will file for and be issued patents presumed valid. Inevitably, time consuming and expensive litigation will follow in order to resolve the conflicting claims.

(2) *With Respect to Practice Before the U.S. Patent and Trademark Office*: If the Solicitor General's petition for a writ of certiorari is denied, the decision below must be interpreted against this Court's holding in *Gottschalk* v. *Benson* by scores of Examiners in the United States Patent and Trademark Office. As a result of the inherent inconsistency between these two opinions, the patentability of "machine systems" will be subject to a wide range of interpretation by the Examiners. Administrative guidelines may limit the extent to which Examiners shall apply these varied interpretations to pending patent applications, but such guidelines will not ensure consistent and uniform interpretations. Inconsistent application of controlling legal principles inevitably will result in protracted patent application prosecution time within the Patent and Trademark Office and costly and time consuming administrative and judicial appeals. This inefficient and wasteful administrative and judicial effort will work to the economic detriment of the public, the Patent and Trademark Office, the courts, and the patent applicants themselves.

(3) *With Respect to Patent Litigation*: Should the Solicitor General's petition for a writ of certiorari be

denied, all patents with claims to "machine systems" based upon computer programs will issue under a cloud of invalidity. Costly and time consuming litigation to resolve conflicting claims to patentable inventions is inevitable. Moreover, licensing such patents will be nothing more than an expensive guessing game with potentially grave economic impact. Parties may be forced into costly litigation to determine patent validity or forced into costly settlements to avoid the significant expenses of litigation.

(4) *With Respect to Government Contracting*: If the Solicitor General's petition for a writ of certiorari is denied, there will be uncertainty with respect to the obligations of Government contractors with resulting economic impact. For example, if a "Subject Invention" under a Government contract is a "machine system" for a programmed general purpose computer, the expenses incurred by the contractor and Government will vary greatly, depending upon whether or not the invention is patentable. Clarification of the decision below will enable Government contractors to ascertain the proper procedures to follow and will eliminate unnecessary and wasteful expenditures.

(5) *With Respect to the Public Generally*: Should the Solicitor General's petition for a writ of certiorari be denied, the questions herein inevitably will be presented to this Court at a future time. If the question reaches this Court through appeal of Federal Circuit Court decisions in patent infringement or licensing actions, a period of several years will have elapsed. Substantial numbers of potentially invalid patents will have been issued in the interim having a correspondingly significant anti-competitive effect upon all areas of commerce and industry touched by computers and computer use.

C. The question presented by the decision below should be reviewed now.

Since the practical result of the decision below will be to bring about an era of uncertainty and confusion in the data processing industry and specifically in the development of computer programs, CBEMA submits that the question presented herein should be determined now with finality. Until the issues are resolved by this Court, those who create and use programs may be compelled to operate in an atmosphere of confusion, distrust and secrecy, and will find it necessary frequently to engage in protracted and costly litigation. It can be anticipated that many of the computer program related patents issued by the United States Patent and Trademark Office as a result of the lower Court's holding will be licensed, and that users will have the option of either accepting the license terms or contesting the validity of the patents in infringement litigation. In such litigation, the user's most basic defense will be that "machine systems" for programmed general purpose computers are not patentable subject matter under the Constitution and the Patent Code, 35 U.S.C. § 101. The decision of the Court of Customs and Patent Appeals in this case will not be binding precedent on the various Federal District Courts and Circuit Courts of Appeals which must decide these infringement suits, and in view of the substantial difference of opinion on this question, it is reasonable to expect that conflicting decisions will occur.

To defer review of the issue of patentability of "machine systems" for programmed general purpose computers until patent infringement litigation eventuates and matures to the point of reaching this Court years hence will simply multiply the opportunities for endless litigation.

CONCLUSION

For the foregoing reasons, we respectfully submit that the Solicitor General's petition for a writ of certiorari should be granted.

Respectfully submitted,

JOHN S. VOORHEES
KENNETH E. KROSIN
RICHARD A. KLEINE
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006
Counsel for
Computer & Business Equipment
Manufacturers Association
(CBEMA),
Amicus Curiae

Of Counsel:

HOWREY, SIMON, BAKER
& MURCHISON
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

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APPENDIX

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PETITION FOR A WRIT OF CERTIORARI FILED FEBRUARY 18, 1975
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ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

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* Not reprinted in Joint Appendix. Citations are to appendix of Petition for Writ of Certiorari.

DOCKET ENTRIES

IN THE MATTER OF THE APPLICATION
OF THOMAS R. JOHNSTON

Board of Appeals Serial No. 624,741

Filing Date March 20, 1972

Term and Docket No. 9088

Date	Proceedings and Orders
	Counsel for appellant: Morton C. Jacobs
	Commissioner of Patents
March 28, 1972	Motion of appellant to suspend all proceedings in this appeal until final action of the Supreme Court in Ex parte Bension, et al No. 71-485 P A No. 8376, filed.
March 31, 1972	Above motion, granted.
February 15, 1973	Suspension lifted pursuant to letters of counsel dated January 26, and February 15, 1973.
September 10, 1973	PRINTED RECORD, FILED.
October 12, 1973	Stipulation to extend time for filing appellant's brief to November 19, 1973, filed and approved.
November 13, 1973	Stipulation to extend time for filing appellant's brief to December 19, 1973, filed.
November 15, 1973	Above stipulation, approved. See letter in jacket.
December 13, 1973	Motion (joint) to extend time for filing appellant's brief to January 18, 1974 and Commissioner's brief to 60 days from filing of appellant's brief, filed and granted.

Date	Proceedings and Orders

January 21, 1974 BRIEF FOR APPELLANT, FILED.

March 21, 1974 BRIEF FOR COMMISSIONER, FILED.

April 4, 1974 Motion of appellant to extend time for filing a Reply Brief to April 25, 1974, filed.

April 9, 1974 Above motion, granted.

April 24, 1974 REPLY BRIEF FOR APPELLANT, filed.

May 8, 1974 Argued and submitted.

August 12, 1974 Motion of appellant for leave to file publication, filed.

August 26, 1974 Opposition by Commissioner of Patents to above motion filed.

August 30, 1974 Appellant's reply in support of motion to filed publication filed.

September 3, 1974 Above motion denied, Markey, Chief Judge.

September 19, 1974 REVERSED, Baldwin, Judge. Dissenting opinion by C. J. Markey. Dissenting opinion by Judge Rich.

October 11, 1974 FINAL MANDATE ISSUED TO COMMISSIONER OF PATENTS.

Feb. 18, 1975 Writ of Certiorari No. 74-1033 filed in Supreme Court on Feb. 18, 1975.

[SPECIFICATION]

APPLICATION OF THOMAS R. JOHNSTON, FILED MARCH 21, 1967, SERIAL NUMBER 624,741, FOR MACHINE SYSTEM FOR AUTOMATIC RECORD KEEPING OF BANK CHECKS AND DEPOSITS

Abstract of the Disclosure. An automatic record-keeping system is provided which is based on machine-readable records of the financial transactions (checks or deposit slips) of a bank customer. In addition to the usual data provided on the transaction slips, a set of code characters identifying the bookkeeping category is also provided. A data processor, such as a stored program digital computer, processes all of the machine-readable records, together with a master file carrying individual charts of accounts (i.e. the bookkeeping categories) for the different customers. Output reports are periodically generated on simple forms which present the customer's records in accordance with his own chart of accounts and accounting procedures.

This invention relates to an automatic record-keeping machine system, and more particularly to such a system suitable for record keeping and bank checks and deposits.

Automatic data processing equipments employing digital computers have been developed for the handling of much of the record-keeping operations involved in a banking system. The checks and deposit slips are automatically processed by forming those items as machine-readable records; that is, magnetic ink characters are imprinted on the check, so that magnetic readers are enabled to process these checks and enter the data in a computer system in the form of coded electrical signals. Other character-reading machines operating on an optical principle for automatically reading special optical type fonts are also employed. With such machine systems, most of the extensive data handling required in a bank can be performed automatically.

It has been found that such data processing equipment, with certain additions and modifications, can be employed to process automatically much, if not all, of the

individual record keeping required by a bank's customers to maintain their own personal and business financial records. That is, as a supplement to the conventional, periodic bank statement furnished to a bank customer, a record summary is provided with makes unnecessary much or all of the tedious bookkeeping and accounting that the customers would otherwise have to perform.

Accordingly, it is among the objects of this invention to provide a new and improved machine system for automatic record keeping.

Another object is to provide a new and improved machine system for automatic record keeping that functions with an automatic system for banking operations.

Another object is to provide a new and improved automatic record-keeping system whereby financial records are kept and maintained with a minimum of manual operation.

Another object is to provide a new and improved automatic record-keeping system for many customers, in which a chart of accounts is provided for each customer which is individually adapted to his requirements.

Another object is to provide a new and improved automatic record-keeping system for supplying financial reports to many different customers on printed forms that are small in size and simple in format and adaptable to various accounting procedures.

In accordance with an embodiment of this invention, an automatic record-keeping system is provided which is especially adapted for use with automatic banking devices for machine handling of the transactions (i.e. checks or deposits) of demand-deposit accounts of bank customers. Machine-readable records of each bank transaction are generated directly on the check or the deposit ticket. The data of such records incorporate those required for conventional banking system presently carried on checks (or deposit tickets); namely, the customer's account number, amount of the transaction, and the type of transaction (that is, whether a check or a deposit). Another set of data forming a machine-readable record is provided on each transaction, namely, a set of code characters that identify the bookkeeping classification of

each transaction; this classification code is called the "category number." The category number is entered by the customer on each transaction slip (check or deposit) at the time it is prepared, in the form of a machine-readable record by means of an appropriate device, or in the form of a set of hand-written numeric characters which are converted to a machine-readable record by the customer's bank.

In the customer's bank, upon a deposit being made or a check clearing the bank, the machine-readable transaction records on the imprinted checks or deposit tickets are read by a suitable document-reader device and stored in a transaction file. To process the transaction file, the automatic record-keeping system employs a data processor, such as a programmable electronic digital computer, having certain data storage files and a control system. In addition to the transaction file, a master record-keeping file is used to store all of the records required for each customer in accordance with the customer's own chart of accounts. The latter is individually designed to the customer's needs and also constructed to cooperate with the control system in the processing of the customer's transactions. The control system directs the generation of periodic output reports for the customer which present the customer's transaction records in accordance with his own chart of accounts and desired accounting procedures. Printed forms of conventional size can be used for the output reports, and a simple format can be employed that is adaptable for automatic printing of the different charts of accounts.

The foregoing and other objects of this invention, the various features thereof, and the invention itself may be more fully understood from the following description when read together with the accompanying drawing, in which:

Fig. 1A is a schematic block diagram of a computing machine system for automatic handling of banking transactions and record-keeping thereof in accordance with this invention;

Fig. 1B is a schematic block diagram of certain working storage sections of the memory of Fig. 1A;

Fig. 2 is a schematic flow diagram of a portion of the machine system of Fig. 1A;

Fig. 3 is a schematic flow diagram of another portion of the machine system of Fig. 1A;

Fig. 4 is a face view of a bank check having machine-readable records in accordance with this invention for automatic record keeping in the system of Fig. 1A;

Fig. 5A is a schematic block diagram of the organization of variable data fields for a plurality of bank accounts in a demand-deposit-account (DDA) master filed as employed in the system of Fig. 1A;

Fig. 5B is a schematic block diagram of the organization fields in DDA and record-keeping (RK) transaction files as employed in the system of Fig. 1A;

Fig. 5C is a schematic block diagram showing the organization of data fields in an RK master file as employed in the system of Fig. 1A;

Fig. 5D is a schematic block diagram of the organization of data fields in a portion of the file of Fig. 5C;

Fig. 5E is a schematic block diagram of the organization of data fields in another portion of the file of Fig. 5C;

Fig. 6 is a schematic block and flow diagram of a portion of the system of Fig. 3, for the master file maintenance run;

Fig. 7 is a schematic block and flow diagram of another portion of the system of Fig. 3, for the transaction file maintenance run;

Figs. 8A, B, C and D are schematic block and flow diagrams of another portion of the system of Fig. 3, for the transaction journal run;

Figs. 9A, B and C are schematic block and flow diagrams of another portion of the system of Fig. 3, for summary sheet run;

Fig. 10 is a face view of a printed transaction journal report form utilized in the transaction journal run;

Fig. 11 is a face view of a printed summary sheet report form utilized in the summary sheet run;

Fig. 12 is a modified form of summary sheet report form;

Fig. 13 is a top view with parts broken away of a check imprinting device for making machine-readable records directly on bank checks for use in this invention; and

Figs. 14A and B are, respectively, perspective and fragmentary front face views of a check-folder and imprinting device embodying this invention and for use in the system of Fig. 1A.

In the drawing, corresponding parts are referenced throughout by similar numerals.

In the system of Fig. 1A, a data processor (e.g. a stored-program digital computer) embodying this invention is employed. The computer may assume many different forms that are well known in the art. For example, it includes a memory 10 having a working storage section 11, an arithmetic unit or processor 12, and a control unit 14. Input devices are provided in the form of a reader device 16 which accepts machine-readable records 18 such as documents (e.g. bank checks and deposit slips) having special character formations. The reader 16 is a suitable document reader for reading prescribed character fields (imprinted on the documents 18 in magnetic ink or special optical type fonts, or presented in punch-card form). A document imprinter 19 is used to enter the prescribed fields on the checks or deposit slips 18 (e.g. it may be magnetic ink or special type font imprinter or a card punch).

Supplementing the memory 10 are various storage-filed devices such as a disc or drum memory or magnetic-tape stores. One set of filed devices takes the form of a set of tapes or discs 20 carrying the transaction, master-file and other data that are supplied to appropriate sections of memory 10 and are employed in the data processor. Another set 22 carries updated files corresponding to the files 20 after certain processing operations have been performed. Another set of files 24 supply control programs or runs to the memory 10 for directing various control operations in proper sequence. The machine may be one operating with binary coded electrical signals, with the signal combinations coded to represent alphabetic and numeric characters in accordance with any desired system. The files 20, 22, 24 con-

tain successive records having fields formed of such character signal combinations. Fixed or variable character lengths may be used for these fields.

An output unit 26 for producing printed records may take various forms that are available in the art. One suitable form is a high-speed printer, and a plurality of such printers may be used for concurrently handling different types of printed output forms. The overall control unit 14 for the data processor performs certain sequences of operation in accordance with the run of the control programs established in the memory 10, and effectuates control of the various portions of the system. In accordance with the operations to be performed in the system of Fig. 1A, the paths of information flow between the various sections of the system and the memory 10 are shown in full lines, while the paths of flow of control signals from the control unit 14 to the other portions of the system are shown in broken lines.

The system of Fig. 1A is illustrated further by the flow diagrams of Figs. 2 and 3. A plurality of ordinary bank checks 40, bank deposit slips 42, and other types of bank transaction slips 44 are currently handled in a manual fashion in present-day banking systems. Batches of such transactions 40, 42 and 44 are proved 45 (checked for accuracy) by an operator, such as the bank teller, and the various data sections thereof are placed in machine-readable form directly on the transaction slips by the imprinter 19. One form of well known device used for this purpose is a magnetic-ink imprinter customarily used by banks for ordinary processing of checks and the like.

A suitable form of check embodying this invention is shown in Fig. 4. This check may assume any of the customary printed formats for bank checks and, in addition, has a three-digit field 46 at a suitable location on the check (for example, just in front of the signature line thereof). This check, when it is employed with the well known form of magnetic-ink coding, receives a plurality of data fields along the lower edge thereof. One such field is the transit-number field 48 which carries the bank number and routing number for automatic

processing of the check in accordance with present-day systems. Another field 50 incorporates the account number (Acctno) of the customer on whose account the check is drawn. The fields 48 and 50 are customarily imprinted on bank checks prior to their being issued to the bank customer. Customarily, an amount field 52 is imprinted on the check at the time of proofing (45) by the imprinter 19 in the bank on which it is drawn (or at the clearing house) for automatic processing of the checks. In addition, a check number (Chkno) may be imprinted in the field 54 prior to issuance of the checks to the customer, or subsequently by the bank.

A two-digit transaction code (Tranco) field 56 is employed to identify the particular type of bank transaction represented by the instrument. That is, the code in field 56 indicates whether the document is a check, a deposit slip, or some other particular type of bank transaction. For checks, which represent the largest number of transactions, this code field 56 is often left blank. An additional field 56 carries the category number (Catno) inserted in the field 46 the writer of the check. This Catno is entered in field 58 either by the writer of the check (if he has an appropriate device for completing the machine-readable record in accordance with this invention) or by the bank on which the check is drawn or which operates the record-keeping system of this invention.

It has been found that a three-digit Catno is suitable for classifying the record-keeping categories in accounting systems employed by most individuals in their personal bank accounts, by most businesses and professional offices, and by most farmers. Such a three-digit Catno is able to provide a simple technique for the writer of checks to classify the RK category of the particular transaction, and similarly to classify the source of income represented by a bank deposit. In a very large number of instances, less than a hundred such categories are required to suitably classify a bank customer's individual "chart of accounts" (i. e. for each customer, his own list of Catnos, their descriptions, and record-keeping interrelationships). A three-digit code affords

the flexibility of separating large areas of records; e. g. categories in the 100 and 200 series may represent different classes of income, and categories in the 300 and 400 series may represent different classes of expenditures. Another example found suitable for family RK classifications is to use the 300 series for family income (both primary and secondary), the 400 series for fixed family expenses (e. g. rent or mortgage), the 500 series for variable family expenses (e. g. food), the 600 series for other income (e. g. dividends, loans), the 700 series for family asset expenses (e. g. investments). For agricultural accounts, it has been found suitable to use the 000 series for family records, the 100 and 200 series for various crops, the 300 and 400 series for livestock, the 500, 600, 700 and 800 series for other farm income and expenses, and the 900 series for capital improvements (e. g. buildings and equipment). For some applications, a two-digit Catno filed may be sufficient to meet the needs of a wide range of customers (this may be treated as a three-digit field, with the first digit handled as "0"). Moreover, the Catno field may be augmented by a fourth digit to afford the flexibility of a more detailed breakdown of any particular area in a customer's chart of accounts (preferably provision for a fourth digit is made in field 58, as indicated in Fig. 4). Such a breakdown may identify particular sales regions or customers for a particular business category, or particular models within a product line. Moreover, after a customer has developed and used his chart of accounts, he may readily modify any desired part thereof (as explained in more detail below) by adding or deleting various Catnos and by inserting (with the fourth digit) additional ones between two successive three-digit codes. Generally, in setting up a particular chart of accounts, certain Catnos in the sequence may be left unused (blank) and undefined so that the customer has the flexibility of using them at a later time as his record keeping changes. If desired, an alphabetic code may be used for the Catno, which may be easier for certain customers to use.

As is described hereinbelow, a bank customer, in accordance with this invention, is individually supplied with his own choice of a chart of accounts in which he selects his own Catnos and the descriptive titles associated therewith. Thereby, each check (Fig. 4) or corresponding deposit slip (which generally has the same format as that of Fig. 4, except that it has a different transaction code in field 56 and the transit field 48 may be omitted since it does not leave the bank) receives a Catno in the code field 46 (if a handwritten field is utilized) and in the machine-readable field 58 for automatic processing thereafter as machine-readable records.

In the system of Fig. 2, as indicated above, the processing operation 45 (which forms part of the initial processing known as the "entry run") completes the coding for the machine-readable fields of the checks 40 and deposit slips 42 if they have not previously been completed. The bank operator also develops a proof tape 60 with the dollar amounts of the batches of checks and deposit slips, and a proof tape 62 of the Catnos of all of the checks and deposit slips. The outputs of the processing operation 45 are the machine-encoded checks 40′, deposit slips 42′, and other transactions 44′ which are utilized, as machine-readable records, as inputs to the system of Fig. 1A as they are read by the document reader 16 in the machine operation 64 (Fig. 2).

In present-day automatic demand-deposit-account (DDA) banking systems in which automatic data processing is provided, the document reader 16 is controlled by an appropriate program to read the successive transaction records 40′, 42′, 44′ and assemble them as a daily transaction file (TRAFI) 70. Each transaction 71, 73 (Fig. 5B) of such a file in accordance with this invention contains data fields respectively representing the Acctno, Catno, Tranco, amount, Chkno, and the date associated with the transaction, as well as any other data desired to be carried along. The TRAFI 70 consists of such transaction records (TRAFR) 71, 73 assembled successively on an output file 22 as they are read by the document reader 16. The fields forming each TRAFR (and the other records of Fig. 5) are preferably located

at prescribed portions of the record, which has a fixed length, so that the desired fields may be readily located and processed in accordance with the known techniques. The TRAFI (Fig. 5B) ends with a special end-of-file record, in accordance with standard techniques, which follows the last TRAFR of the file; the other files are similarly constructed with suitable end-of-file records.

The operation of the computer (Fig. 1A) is under the control of a DDA Run of the control program which is stored in the memory 10 at this time. In one conventional form of such DDA run, the control 14 operates the processor 12 to produce an accumulated net total of all of the amounts in the transactions 40′, 42′, 44′ making up a particular batch and controls the memory 10 and output printer 26 to provide a proof listing 66 of all such amounts and the accumulated net total thereof. In accordance with the system of this invention, the DDA run is modified so that the control 14 similarly operates the system to produce a listing of all Catnos and an accumulated absolute total thereof. Thereafter, visual checks (or, if desired, automatic comparisons and checks if the contents of lists 60 and 62 are read into the machine) may be made of the corresponding totals provided by the proof listing of amounts 66 with the corresponding amounts of the proof tape 60 to check on the accuracy of the machine entry of the data. An additional such check is provided by the comparison of the Catno totals in the proof listing 68 with the corresponding total of the proof tape 62; thereby an improved accuracy check is provided.

In ordinary DDA processing, the daily TRAFI 70 is sorted into Acctno sequence; in this invention the Acctno field 50 and Catno field 58 are treated as one combined field, and the sorting in operation 72 is by both. The DDA Run controls the posting of the sorted TRAFRS to the DDA master balance file 75 as indicated by operation 74.

The format of the DDA master balance file 75 is shown in Fig. 5A, in which the sub-files 76, 77 making up each account are assembled in Acctno sequence and the data

fields that form each account's sub-file include successively those for Acctno (which may include the bank number where a central processor for several banks is used), the name and address of the bank customer, the account balance amount, an RK flag (if the account is to be processed in the record-keeping system), and one or more other fields for data such as service charges to the customer and bank statement cycle times. The DDA Run locates a particular sub-file 76 or 77 in the master balance file 75 corresponding to a TRAFR Acctno and posts the amount of the TRAFR to develop a new account balance in the corresponding field of that sub-file.

The output of the processing operation 74 is an updated DDA master balance file 78. Subsequent to the posting of each transaction, the RK flag field in that account's sub-file 76 or 77 is tested (80) to determine if it is an account that receives automatic record-keeping. If so, the particular TRAFR is also transferred to an RK TRAFI 82 that is built up for that day's transactions. The TRAFI 82 contains only those TRAFR 71, 73 for RK Acctnos, which are arranged sequentially on one of the output file devices 22. The DDA operation is completed for each account periodically in the usual fashion; i. e. on those days when bank statements are to be generated, the customary bank statement 85 is printed out (83) for each account, which statement carries the account balance as well as a listing of all of the transactions for the statement period. The transactions for each account during the bank statement period are indicated either in a cumulative transaction file (which is assembled on successive days by adding the current day's transaction file to the previous day's file) or by carrying the cumulative transactions in the DDA master balance file as a listing of transactions following the "other data" field. In this invention, an additional output file 87 is generated from the DDA processing 83; this file contains a series of records for the RK Acctnos. Each such record (148 in Fig. 5C) contains a "credit" field 150 (consisting of the total deposits on the monthly statement), a "debit" field 151 (consisting of the total checks) and a field 149 for a special identifier of that record.

These records are added to the RK master file, as explained below for Fig. 6, and for that purpose each record also contains a change-instruction field that is coded so that the record is added to the proper account sub-file of the RK master file.

The flow chart of Fig. 3 illustrates the processing of the RK data to printed RK reports that are sent to the bank customers and ordinarily with the usual bank statements. The daily RK TRAFI 82 developed from each day's transactions for the RK accounts is added to the RK TRAFI 84 (one of the files 20), which stores the accumulated transactions of previous days. The processing 86 updates file 84 by inserting the TRAFR of file 82 in the proper order by Acctno, Catno and date. The update processing 86 also serves to correct any errors that may exist in the TRAFI 84, and correction records 88 are also supplied to direct the desired changes in the TRAFI. The output of the processing 86 is the updated RK transaction file 92 (on one of the files 22), together with a printed list 90 of all of the new TRAFR supplied by the file 82 and all of the changes from the records 88.

An RK master file (MAFI) 94 (one of the files 20) is utilized which contains all of the required RK information about each RK account, including the customer's individual chart of accounts, as explained below. This MAFI 94 is maintained by update processing 96, which controls the performance of any changes, additions or deletions of entire accounts, or parts of accounts, that are specified by records 95. The output is an updated RK MAFI 98, as well as a list 97 of changes. The updated files 92 and 98 are the inputs to a transaction journal (Tr-Jrnl) Run 100. This run processes each account of MAFI 94 in the individual fashion determined by the customer's chart of accounts and in accordance with all of the customer's transactions for the particular statement period. The output is a printed transaction journal 102 for each account. Another input to this run 100 is a set of records 101 which determine the particular accounts to be processed on any given date (e. g. a particular sequence of account numbers may be set up to be processed at certain regular periods); also special re-

quests for reports of particular accounts can be made by any of these records 101. The input records 88, 95 and 101 may be stored on predetermined sections of one or more of the files 20; they may be punch-card records where appropriate for the computer hardware, or they may be entered manually via the computer console where few in number.

The Tr-Jrnl 102 contains a separate printed listing (see Fig. 10 for a pre-printed format) for each account of all of the transactions (checks and deposits) that were cleared during the cycle period. These are arranged in columns by Catno, Chkno, date, the amount, and the type of transaction, as well as by comments indicating the absence of a Catno (Non-Code) on the check or deposit slip, the use thereon of an invalid code in the customer's chart of accounts stored in the MAFI, or by the inconsistency of an income Catno being employed on a check or that of an expense Catno on a deposit slip, all is determined by the chart of accounts in MAFI 98. In addition, a sub-total for each Catno is indicated by "* * *" on the Tr-Jrnl.

The Tr-Jrnl Run 100 also flags all of the TRAFR of file 92 that it processes, and the flagged TRAFR are retained in case a re-run is required for a particular account. All of the TRAFR that were flagged on the previous cycle (i. e. those TRAFR in file 92 that contain flags and are presented as inputs to run 100) are not processed, but are conditioned to be dropped automatically by the subsequent Update TRAFI Run 86. Thus the output 104 from run 100 is a flagged and purged TRAFI, which is used as the input file 84 for the next TRAFI Update Run 86, as indicated by the connectors in Fig. 3.

The run 100 also augments all of the year-to-date (YTD) balances carried for each account in its sub-file of the RK MAFI 98 (as explained below for Fig. 5C). That is, as the run 100 develops the totals within each category which is utilized for the Tr-Jrnl, the corresponding totals on a YTD basis are augmented in MAFI 98. The output is MAFI 106, having the new YTD totals and also carrying the current cycle period's totals of trans-

actions for each Catno. Thus the MAFI 106 temporarily stores the current month's totals for each category, which are utilized in the next run 108 for processing the summary-sheet reports (Fig. 11 or 12).

The Summary Sheet Run 108 receives the MAFI file 106 as its input, as well as the cycle and request records 101. The Summary Sheet Run 108 produces as outputs, different summary sheets 110, 112 and 114 (in one form of the invention), which have somewhat different format characteristics to meet the special record-keeping needs of different classes of customers; that is, the summary sheets 110 are for personal bank accounts, sheets 112 for business accounts, and sheets 114 for agricultural accounts. A summary sheet format suitable for the personal and business accounts is illustrated in Fig. 11, and such a format suitable for agricultural accounts is illustrated in Fig. 12. However, these formats are not restricted to any particular type of account, and each customer's chart of accounts also specifies the particular format for his summary sheet, as explained below.

The summary sheet of Fig. 11 is simple in format, having a space 120 for printing the name and address of the customer and the Acctno, which data are obtained from the name record (described below) of the account's sub-file in MAFI 106, and a space 122 for the month and year, which information is obtained from the cycle record 101. The summary sheet of Fig. 11 is arranged with a plurality of columns having (in one form of the invention) pre-printed captions. The first column 124 contains the Catno, which the output printer inserts therein for each item of the customer's chart of accounts from MAFI 106, which also supplies the category description for that Catno to be imprinted in column 126. Columns 128 and 130, respectively, receive the printed amounts from MAFI 106 corresponding to the current-period's amount totals for a particular Catno and the YTD total. The run 108 does not modify the data of MAFI 106 and consists essentially of a print-out of the MAFI for the particular account (modifications of this run are described hereinafter). After the run 108, MAFI

106 is subsequently utilized as the file 94 for the input of the next MAFI Change Run 96. In other forms of the invention, the summary sheet is not arranged with preprinted captions, but instead the columns and captions are arranged in accordance with the customer's individual chart of accounts on the Summary Sheet Run. Likewise, the Jrnl format (Fig. 10) may have the captions inserted by the Jrnl Run 100 instead of being pre-printed. Thereby, a standard blank report form may be used for each type of report, with the differences being composed by the runs themselves.

The various portions of the RK Runs shown in Fig. 3 are described hereinafter in some detail. These runs refer to the file formats which are described with respect to Fig. 3.

FILE FORMATS. DDA Master File. As described above, a standard DDA file 75 (Fig. 5A) provides a sub-file 76, 77 (or set of data) for each demand-deposit account, with the sub-files for all of the accounts being arranged in a certain sequence such as an ascending Acctno order. The DDA master file, in accordance with this invention, has a specified field provided for the RK flag. This field may consist of a single bit that identifies whether the account is one to be processed by the RK system or not. Alternatively, different classifications of RK processing may be provided by using more than one bit; e. g. three RK flags may be provided corresponding respectively to three classes of record-keeping for agricultural, business and personal bank accounts, where separate daily TRAFIS 84 are to be set up for each class of accounts.

Transaction File. The transaction files (Fig. 5B) are each made up of a sub-file 71, 73 of records carrying the data of the various transactions, as described above.

Record-Keeping Master File. Fig. 5C illustrates the format of the RK MAFI, which is made up of a series of sub-files 140 for each account number, with these sub-files following one after the other and arranged in ascending numeric order. Within each account sub-file, a number of records are set up in a prescribed order; each record is assumed (in this embodiment) to be of a pre-

scribed length, and contains various fields at prescribed locations. The first record is a name record 142 for the particular account, and it carries ordered fields 143, 144 for the Acctno and the name and address of the customer, a field 145 (usually the initial field) identifying the record as a name record, a system-flag field 146 defining the particular classification of account (e. g. business, personal or agricultural), a cycle flag 147 which identifies by a code the time periods in which the account is to be ultimately processed to a customer report, as well as flags that define the accounting time periods for zeroing YTD totals (e. g. the fiscal-year month). A second record 148 has an identifier field 149 and net-credit and net-debit fields 150, 151 which are used ultimately for proofing the Jrnl totals against the DDA balance (these records are obtained from file 87, Fig. 2). The remaining records are each associated with a different Catno and together they make up the customer's individual chart of accounts. These records are of two types: one is a title (or title and total) record 160 (Fig. 5D), the other a year-to-date (YTD) record 162 (Fig. 5E). Each record 162 contains the titles for its Catnos, as well as the associated numeric amount totals on which the RK reporting is based. This series of records, which may be selected and varied in any desired fashion, incorporates the individual chart of accounts provided for each customer. Certain sections of the chart of accounts may be the same for a number of customers (e. g. income and, expense sections for the business type of records) and, as described below, variations are also provided for. Generally, each record is formed with a certain basic character length (e. g. that of a standard punch card), and certain records (e. g. that of the name record 142) are formed of a multpile of the basic length. The title and YTD records 160 and 162 each have the Catno and other fields at specified locations.

In Fig. 5C, the chart of accounts section of each account sub-file 140 is shown divided into a number of records which are initiated by a "General Title" record 152 which carries the alphabetic Catno. As shown in Fig. 5D, title records 160 have an initial identifier field

164 specifying the type of record and the type of totalizing operation to be performed, if any; thereafter, a title description and Catno fields 165 and 166.

Following a first "General Title" are a plurality of YTD records 153, 154. As many of these are provided as may be required for the customer's chart of accounts. As shown in Fig. 5E, each YTD record contains an initial identifier 167 followed by fields 168 and 168′ in which the numeric totals for YTD and current month, respectively, are accumulated for the associated Catno, where the latter is an expense item. Similarly, fields 169 and 169′ store totals for the same Catno where the latter is an income item. Flags 170 and 171 specify respectively whether either or both of the fields 168 (168′) and 169 (169′) are active for the particular Catno. That is, the flags 170 and 171 are provided depending on whether the chart of accounts follows the form shown in Fig. 11 or 12 (namely, depending on whether the Catno applies to either expense or to income, or to both, respectively). Following a first series of YTD records 153, 154 is a Level-I total (i. e. a sub-total) record 155 (of the type shown in Fig. 5D). This record contains an operator field 164 that specifies the particular control operations to be performed in the Summary Run 108. Successive such sub-file sections are provided as may be required for individual accounts (each including a group of records such as 152, 153, 154, 155), and a final Level-II total field 157 is provided where an accumulated grand or net total is stored; its operator field 164 is coded to specify the particular Level-II totalizing to be performed. Each total record 155 or 157 operates with all of the category data set forth in the preceding records up to any preceding total record of the same or higher level. As shown in Fig. 5C, only two levels of totalizing are illustrated (those of records 155 and 157). This invention contemplates the use of as many such levels as may be required for any particular account. The identifier 164 is coded to specify at which particular level the total is taken.

The working storage section 11 of memory 10 is shown in Fig. 1B. For many of the runs, two input files 20′ and 20″ are used with two associated output files 22′ and

22″, respectively. Each record from the Input-I file 20′ is transferred to an associated input register 180, from whence it is transferred to the output register 182 and therefrom the Output-I file 22′. Similarly, input and output registers 184 and 186 operate with Input-II and Output-II files 20″ and 22″. Various other storage registers are identified hereinafter in connection with the associated runs.

Master-File Change Run (Fig. 6). The inputs to this portion (run) of the system are (1) the RK MAFI 94 (Fig. 3), if one already exists, and (2) a maintenance or change file (CHFI) 95, which may be a set of records (e. g. punch cards, magnetic tape, or disc file) that set forth the changes and additions to be made to the master file. Each record of the CHFI 95 is identified by a field containing the associated Acctno, and all of these records are sorted in ascending order, as are those of MAFI 94. Four types of CHFI records are provided (in this embodiment) which are similar in format to the corresponding MAFI records (Figs. 5C, D and E), and carry certain modifications as noted (the reference numerals of the corresponding MAFI fields are referred to for identifying the CHFI fields):

(1) A CHFI name record carries any changes in the customer's name and address 144 and system and cycle flags 146 and 147 in a format similar to the MAFI record 142. The same special identifier field 145 is provided for this CHFI record. In addition, a predetermined change-instruction field carries a code that identifies either (a) delete a complete account, (b) add an entire new account, or (c) change the fields of the MAFI name record 142 to contain the data carried in the corresponding fields of the CHFI record.

(2) CHFI YTD records (similar to the MAFI record 162, Fig. 5E) have fields for the Catno and name, as well as for YTD expenses and YTD income; these CHFI YTD records carry a special identifier (i. e. the same as field 167) as well as a change-instruction field that identifies by code the type of maintenance operation to be performed (e. g. a code specifying a change of the entire

MAFI YTD record in accordance with the fields of this CHFI record). Another operational code may specify the deletion of the complete MAFI record corresponding to the Catno of the CHFI YTD record, or the addition of the entire CHFI YTD record. Another operational code may specify that one or more fields of a corresponding MAFI record should be changed in accordance with the data set forth in the corresponding CHFI fields (which may include an algebraic identifier for adding or subtracting dollar amounts).

(3) A CHFI title record (similar to MAFI record 160, Fig. 5D) carries a Catno and title description fields. The CHFI title record also has a field to provide a unique identifier corresponding to that of 164 in the MAFI records for general title, and Level-I and -II totals. A change-instruction field in the CHFI title record also determines whether the maintenance is to be a change in part of the MAFI title record, or an addition or deletion of the entire record.

(4) A CHFI record for net credit and net debit records carries a special identifier in field 149 and corresponding fields for credit and debit which are to replace the corresponding data fields 150 and 151 in the MAFI record.

Where the MAFI file does not exist, the CHFI contains all of the records required to compose the MAFI file. Where a new account is to be added, the CHFI file contains all of the records composing this new account and the change MAFI Run is designed to insert the successive records in the proper Acctno and Catno order in the MAFI file. If an entire account is to be deleted, the CHFI name record identifies this deletion and the run is designed to delete all of the records of that account subfile from the MAFI.

The MAFI 94 is set up as Input-II file 20″ (Fig. 1B) and the updated MAFI 98 is generated as Output-II file 22″. The CHFI file 95 is set up as Input-I file 20′, and no corresponding output file is generated. The CHFI file 95 (Fig. 3) is previously sorted in ascending Acctno order, and within each Acctno the records are sorted by identifier code numbers 145 and 149 to provide (a) a name record 142 and (b) a net cred-deb record 148, and there-

after (c) title and YTD records 152, 153, 154, 155, 157 are arranged in ascending Catno order.

In the flow charts (Figs. 6, 7, 8 and 9) standard symbols and representation are employed. Main control flow is represented by a rectangle for a processing operation, a trapazoid for processing that includes an input or output operation, and a hexagon for a predefined process such as a subroutine; a diamond is used for a decision or test with the main and branch flow paths indicated, and a subroutine may itself contain one or more decisions. Connector circles set forth the reference numerals of succeeding branch and main-flow operations. Generally, the flow paths are from top to bottom and from left to right; however, for simplicity of illustration minor variations therefrom are employed. The details and interrelationships of the operations are described in the specification with reference to the flow charts. The operations consist of basic machine operations or combinations thereof which are generally of an elementary nature, such as the basic arithmetic, comparison, code-recognition and input-output and transfer operations, and will be readily apparent to those skilled in the art.

Initially in this run (Fig. 6) the first operation 200 GETS a record CHFR from the CHFI file 20′ (Fig. 1B) and places it in working-storage input register 180 (Fig. 1B) in memory. Then test 202 determines if it is an end-of-change-file record (EOCHF) by looking for the associated identifier code at a prescribed field location). If NO, the next operation 204 GETS a record MAFR from the MAFI file 20″, places it in input register 184, and test 206 similarly determines if it is an end-of-file record (EOMF). If NO, test 208 determines whether the records are equal on control. This test 208 is composed of several tests, and initially determines whether the Acctnos for the two obtained records (CHFR and MAFR) are identical.

After equality of Acctno is determined, a test determines whether there is equality on the identifier 145 associated with name records 142. If not, a test is made to determine if there is equality on the cred-deb identifier 149; and if not, a test determines if there is equality

on Catno. Thus the tests 208 obtain equality on control for the CHFR and MAFR records by first obtaining equality on Acctno, and thereafter equality by testing the successive records as they would ordinarily exist within the master file. Test 208 proves YES whenever one of the additional subsidiary tests proves YES, and it proves NO whenever any test is NO.

Upon obtaining equality on control, the next test 210 determines whether the change-instruction field of the CHFR in register 180 calls for a "change". If YES, the appropriate fields of the MAFR in register 184 are changed (212) accordingly. A message print-out 214 identifies the change that was made; and the changed MAFR is PUT (216) on the updated MAFI 22″ in proper sequence (the PUT operation may vary for different computers; it is assumed, by way of example, that it consists of transferring the contents of output register 186, namely, the preceding record, to file 22″ and transferring the contents of register 184 to register 186).

The CHFR in register 180 is discarded after its change is made; i. e. the program returns to GET (200) the next CHFR without PUTTING the previous CHFR, so that the latter is written over in register 180. This loop is repeated, by GETTING the next CHFR and MAFR, since the preceding records of each were fully processed. This processing continues, and if the test 210 proves that the CHFR is not a "change", the next test 218 determines if its change-instruction field calls for the deletion of a record. If not, an error is indicated, since equality of control at test 208 requires either a change or a deletion, which error is handled by the print-out 220 of an error message. The unchanged MAFR in working storage 184 is PUT (216) to the updated MAFI, and the program returns to GET (200) the next CHFR. If the Delete test 218 proves YES, the program branches for a print-out 222 of a message identifying the deletion. Thereafter, the program returns to GET (200) the next CHFR and MAFR without a PUT to the updated MAFI; that is, the record is effectively deleted by its not being put out to the MAFI, and it is written over in register 184 by the

next MAFR. If desired, a single CHFR may be employed for deleting all of the records of a particular account. For this purpose, a special loop would be provided in the branch from test 218. In this loop (not shown) a first test would determine whether the deletion was of a single record or of the entire account. If a single record, then the operating 222 would be performed, as shown in Fig. 6. If the full account is to be deleted, a subsidiary loop proceeds to GET MAFR, then a test EOMF; and if NO, a test for equality on Acctno. If YES, the MAFR is deleted by printing a message and returning in the same loop to GET the next MAFR. This subsidiary loop continues iteratively until the test for equality on Acctno is NO. Thereupon, the loop exits to GET the next CHFR, testing for EOCHF, and returning to the main flow at the input to test 208.

If test 208 indicates that CHFR and MAFR are not equal on control, the program branches to test 224 in order to proceed with the control operations required to find the next such equality. Test 224 determines whether the CHFI record is higher in sequential record than the MAFR (the order, as noted above, being determined first by Acctno and thereafter by the identifiers 145 and 149 in the name and cred-deb records 142, 148, and subsequently by Catno. If the CHFR is high (and since the records are arranged in ascending order), test 224 indicates that no CHFI records exist calling for changes to be made in that particular MAFR; and it is PUT (226) to the updated MAFI unchanged, and the program returns to re-entry 204 to obtain the next MAFR. However, if the CHFR is not higher in sequence (test 224 is NO), then the CHFR in input register 180 should properly be a record to be added, since its sequence falls in place before the current MAFR. Therefore, the next test 228 checks the charge-instruction code in the CHFR looking for an ADD; if it is not, the program branches to print out 230 for an error message and proceeds to GET (232) the next CHFR. The test 234 for EOCHF is again performed at this point; and if not the end-of-file, the program returns for the equality test 208 with the MAFR

that remained in register 184. If the ADD test 228 is YES, the proper fields of the CHFR then in register 180 are PUT (236) to the updated MAFI via output register 186, and an appropriate message is printed out (not shown). Thereafter, a GET 238 of the next CHFR is followed by a test 240 for EOCHF, and if NO, the program returns to the test 208 for equality.

The foregoing outlines the overall control program that produces the updated MAFI 98 in file 22″. Remaining are certain control operations that are performed when a test finds EOMF or EOCHF. Either of the latter can occur first, and the run terminates upon both occurring. When test 206 for EOMF is YES before that for EOCHF, the remaining CHFI records are those for new records for the last account and/or records for new accounts of higher account number; for this processing the program branches to test 242. The latter determines whether the CHFR is one to be added (which it should be except as an error); and, if not an ADD, the program branches to print out 244 for an appropriate error message. The program proceeds to GET (246) the next CHFR, performs the EOCHF test 248; and if NO, the program returns to ADD test 242. If the latter 242 finds an ADD record, that CHFR is PUT (250) to the updated MAFI file with a message print-out 252, and the next program steps to GET 246, and so on as described. These alternative loops are repeated until the EOCHF test 248 is YES, and the program branches to the end-of-the run process 254, which performs the particular housekeeping followed to wrap up this run and bring in the next one.

If the EOCHF test 202 is YES before that for EOMF, no further changes are to be made, and the program branches to GET (258) the next MAFR with a test 260 for EOMF. If the latter tests NO, the program returns to PUT (256) the MAFR and GET (258) the next one, and so on. In this way, the remaining MAFI records are successively GOTTEN and merely PUT to complete the updated MAFI until EOMF tests YES, and the run ends. Similarly, when test 240 is YES, the current MAFR in register 184 is PUT 256, and the run winds up as described.

In operation of the MAFI Run, test 208 determines if the correct MAFR is located to which a correction is to be made as specifically by the CHFR. Thereafter, tests 210 and 218 identify the character of the correction which is then carried out by the associated branches 212 and 222, respectively. If the CHFR does not call for a correction, test 208 is NO and the record should be an ADD, absent some error. The loop of test 224, PUT 226 and back via GET 204 locates the correct position in the MAFI sequence in which the CHFR is to be added, and when it is (absent an error), the CHFR is inserted by PUT 236. When EOMF occurs prior to EOCHF, the remaining CHFI records are added to the end of the MAFI via branch from test 206 to test 242 and PUT 250, and so on. When EOCHF occurs first, the remaining MAFI records are read out to the updated MAFI via a branch from test 202 or 234.

Transaction File Update and Change Run (Fig. 7). Processing 86 of TRAFI primarily calls for adding the new transactions of the daily TRAFI 82 (Fig. 3) to the accumulated TRAFI 84 of the previous days' operations. This operation can be considered to be a daily operation in which the new transactions are merged with those of TRAFI 84 in proper sequential order at the end of each day's DDA processing. Alternatively, the daily TRAFIS 82 for an entire statement period can be left unprocessed until the statement time, and then an overall sort performed on them. In actual operation, it is found generally desirable (where the work load warrants it) to perform this merging of each daily TRAFI with the accumulated TRAFI on a day-to-day basis. In addition, it is found that a certain amount of maintenance is required of the transaction file due to errors that may occur in the bank processing or due to customer errors. The TRAFI Update and Change Run described below assumes the latter type of situation where a day-to-day maintenance of the transaction files is desired in order to handle such error correction.

The TRAFI Run (Fig. 7) is substantially similar to the MAFI Change Run described above with respect to Fig. 6. The inputs to the TRAFI Run (as shown in

Fig. 3) are the RK TRAFI 84, which contains the accumulations of the transactions of previous days, the current daily TRAFI 82, which is presorted in ascending sequence order (at least by Acctno, Catno and date), and (as a prefatory addendum to TRAFI 82) the records 88 of changes to be made in the RK TRAFI. Each change to be made in file 84, in this embodiment, is represented by two change records 88; i. e. a record having a change-instruction field that calls for a deletion from file 84 of the entire identified transaction that is in error, followed by a record adding the entire transaction with the correct data.

For simplicity of illustration, the TRAFI Run of Fig. 7 omits certain portions of the run which are substantially the same as those described above with respect to Fig. 6. In Fig. 7, parts corresponding to those of Fig. 6 are referenced by similar numerals, with the addition of *a*. In reading Fig. 7 together with Fig. 6, references to "MAFR" are read as "TRAFR"; that is, for purposes of Fig. 7, the file being updated is the TRAFI (just as the MAFI is updated in Fig. 6). The change-file records (CHFR) of Fig. 7 are composed of the records 82 and 88 (Fig. 3) pre-sorted to be in proper sequence.

The TRAFI Run starts with GET 200a CHFR, a test 202a for end-of-file, GET 204a TRAFR, a test 206a for end-of-file, followed by a test 270 to determine whether the Acctno is blank (which condition comes about, as described below, when processed TRAFRS are flagged in the Jrnl Run, and then in a subsequent Jrnl Run their Acctno fields are blanked). If test 270 is YES, the program loops back to GET 204a the next TRAFR, without a PUT of the TRAFR with the blank Acctno, and thereby dropping it. If test 270 proves NO, the program then tests 272 to determine if the change record contains a Delete change-instruction field. If it does not, then it must be an ADD record (since only two types are used), and the program branches to test 224a to determine if the CHFR sequence order (Acctno, Catno and date) is greater than that of the TRAFR. If it is, the TRAFR is PUT 226a and the program returns to GET 204a the next TRAFR; and if it is not, the CHFR

must be an ADD, and it is PUT 236a. A message print-out (not shown) of the ADD record is performed, which is followed by GET 238a the next CHFR. Thereafter, the program proceeds to test 240a for EOCHF, and the program follows the corresponding operation described above for Fig. 6.

If test 272 finds a Delete record, test 274 then determines whether there is equality on control on a first set of criteria which are limited to the Acctno, the Catno and the date. If that equality is found, test 276 checks a second set of criteria for equality of control to locate the precise TRAFR identified in the Delete record; i. e. the criteria include the Chkno (the check or deposit number), the Tranco, and the amount of the transaction. If test 276 finds equality, a print-out 278 of a Delete message follows, and the program returns to GET 200a the next CHFR and GET 204a the next TRAFR without a PUT of the TRAFR or CHFR, and thereby deleting the TRAFR. If test 276 does not find equality, the TRAFR is PUT 280 and the program returns to GET 204a the next TRAFR. This control loop continues via equality tests 274 and 276 until the precise TRAFR to be deleted is located and effectively deleted via the path 278.

If the test for the first criteria proves NO, the program branches to test 282, which determines if the CHFR sequence order (Acctno, Catno and date) is greater than that of the TRAFR. If it is not, an error is indicated in the data of the CHFR, which error is identified by a print-out 284 of an error message, and the program continues to GET 238a the next CHFR. If the test 274 proves NO, and test 282 proves YES, the program branches to PUT 280 the TRAFR and returns to GET 204a the next TRAFR, and so on until test 274 is YES. If EOTRF test 206a is YES, the branch is to test 242a to determine if the CHFR currently in input register 180 is a DePete or an ADD. If a Delete, an error is indicated by a print-out 244a; otherwise, the program proceeds to PUT 250a the remaining CHFRS until test 248a finds EOCHF and the run ends (254a).

In other respects, the TRAFI Run (except in one respect noted hereinafter) is the same as the MAFI Run in the general control procedures to be followed. In the TRAFI Run, the special addition of handling blank Acctno fields is dealt with following each test for EOTRF (such as test 206a and that corresponding to test 260 in Fig. 6). This is done by performing a test similar to test 270 to determine if the TRAFR Acctno field is blank; if YES, the program loops back to GET the next TRAFR without a PUT of the current TRAFR and thereby dropping it. If the Acctno field is not blank, the loop back is PUT for the current TRAFR (which retains that record) and then GET the next TRAFR.

In operation of the TRAFI Run, test 272 distinguishes between the two types of CHFI records. In an ADD, the addition is made by locating the position in the TRAFI sequence in which the CHFR is to be added. This is done via the loop of test 224a, PUT 226a and back to GET 204a, and so on, until test 224a finds a TRAFR with the same or lower sequence order, at which the CHFR is PUT 236a. If the CHFR is a Delete, the correction is made by locating the precise TRAFR that is to be deleted. A first loop (tests 274 and 282, PUT 280, GET 204a, and so on) locates the section of the TRAFI having the same sequence order (Acctno, Catno and date). Thereafter, a second loop (test 276, PUT 280, GET 204a, and so on) locates the precise TRAFR (same Chkno, Tranco, and amount) and that TRAFR is dropped via path 278. The TRAFI Run also drops TRAFRS that have been previously processed in the Jrnl Run which results in a blanking of their Acctnos. Test 270 recognizes the blank Acctno and that TRAFR is dropped by the loop back to GET 204a without a preceeding PUT.

Transaction Journal Run (Fig. 8) The Jrnl Run 100 (Fig. 3) generates a printed report for each customer of his transactions for the reporting period. The inputs to this Jrnl Run are the updated RK MAFI 98 (used as Input-II file 20″ of Fig. 1B) and the updated RK TRAFI 92 (Input-I file 20′). The TRAFI is updated

and corrected by the TRAFI Run 86, so that all of the TRAFI records are in proper sequential order consistent with that of the MAFI. The updated MAFI 106 is put out to Output-II file 22″, and the processed TRAFI 104 to Output-I file 20′. Other inputs include a cycle-number record (CYC) 101 which sets forth the beginning and ending Acctnos to be processed by the Jrnl Run (these Acctnos are entered in the cycle working-storage register 190), and a set of special request records (REQ) 101 identifying particular Acctnos to be processed. The REQ Acctnos are presented in assending numeric order and may include Acctnos that are either within or outside the cycle range (these REQ Acctnos are established in storage register 192).

The printing of the Jrnl for a particular Acctno is controlled by the Acctno being specified by a REQ or by the Acctnos of the CYC. Thus, a Jrnl is printed where the MAFI and TRAFI records match on Acctno, and the Acctno matches either a CYC or a REQ. Where the Acctno of a MAFR matches the REQ or the CYC, but the TRAFI does not have the corresponding Acctno, the account is one in which there was no activity during the month, and the Jrnl Run prints out the Acctno and name data to indicate that that account was not skipped over by error. All of the TRAFRS that are processed are flagged, and any TRAFR that was flagged the previous month has its Acctno blanked so that there is no further processing of that record's data. The totals that are generated in the Jrnl report are Catno sub-totals for deposits and checks as well as the overall account totals for deposits and checks.

A flow chart of one form of Jrnl Run begins with certain control operations shown in Fig. 8A. It starts with GET 301 MAFR and GET 302 TRAFR. Test 303 determines if the TRAFR is an end-of-file record and, if so, the program branches to the EOTF subroutine 304 (Fig. 8B) at test 350. If not, the program proceeds to a predetermined process or subroutine 305, which incorporates a sequence of operations described in detail below (operations 444, 446 and 448 of Fig. 8C). That is, subroutine 305 tests to determine if the Acctno

of the TRAFR in register 180 is blank and, if so, it is PUT 306 (and not processed) and the program loops back to GET 302 the next TRAFR. A second test in subroutine 305 determines if the TRAFR was previously processed and flagged; if so, its Acctno is blanked, it is PUT 306, and the loop back GETS 302 the next TRAFR, and so on until subroutine 305 finds a TRAFR that is suitable for processing, whereupon the next steps are to GET 307 the CYC record (i. e. enter the range in register 190) and to GET 308 the next REQ record (i. e. enter it in register 192).

When the four different records have been set up in storage registers 180, 184, 190, 192, test 310 determines whether the REQ and MAFR are equal on Acctno. If YES, a REQ-reentry switch is set 312 and the program continues with a test 314 for equality on Acctno between MAFR and TRAFR. If Yes, the program exits to a subroutine 316 (Figs. 8C, D and E) that performs the processing of all the TRAFR and MAFR for that account, and thereafter reenters via test 318, which steers the program to the appropriate reentry point, depending on whether or not the REQ-switch had been set at operation 312. Thus, if test 318 proves YES, the exit to subroutine 316 was initiated by equality on REQ and the program returns to GET 308 the next REQ. In subroutine 316 (as explained, below) the processing of all the records for the current Acctno is completed, and initial MAFR and TRAFR for the next Acctno in each file are obtained before exiting.

If test 314 proves NO, the program branches to test 320 to determine if the TRAFR Acctno is higher than that of the MAFR. If YES, the program exits to subroutine 316 and the MAFR Acctno and name only are printed out (this situation arises when there was no activity in the account for that particular month. If test 310 proves NO, test 322 determines if the MAFR Acctno is high with respect to the REQ Acctno. If test 322 is YES, an invalid REQ is indicated and control branches to a print-out 323 of an error message, and the control returns to GET 308 the next REQ. However, if test 322 is NO, the MAFR Acctno must be low with respect to

that of the REQ, and thereafter a test 324 determines if the MAFR Acctno is equal to the current CYC (i. e. determines if it lies within the Acctno range of the current CYC). If YES, the branch goes to test 314 for comparison with the TRAFR Acctno and any processing that is required in subroutine 316. Upon leaving subroutine 316 under these circumstances, the result of test 318 is NO, and the reentry is to test 310, where the Acctno of the new MAFR obtained in subroutine 316 is first tested against the current REQ, and so on as described.

If test 324 proves NO, the test 326 determines if all the REQS and the CYC range have been processed (e. g. by testing a switch set at the end-of-request records, and by testing if the MAFR Acctno exceeds the upper bound of the CYC range). If YES, the branch is to wind-up 328 and thence to end-run 330. If test 326 is NO, the next Acctno is obtained from the MAFI file. That is, a loop is provided as follows: PUT 332 the MAFR, GET 334 the next one, test 336 for EOMF and, if NO, test 338 for the same MAFR Acctno, and if the latter is YES, the loop returns to entry 332. Test 338 may be performed by looking for the identification field 145 in the new MAFR which would indicate a name record 142 and therefore a new Acctno. Alternatively, each MAFR may have an additional field carrying the associated Acctno (which has been found desirable for greater reliability) and test 338 is there performed by comparing Acctnos in the input and output registers 184, 186.

If test 338 is NO, control returns to reentry 310 for a test against the current REQ Acctno. If test 336 is YES, control branches to wind-up 328. The wind-up 328 performs a number of operations to tie up certain loose ends that may remain; i. e. a test is made to determine if any REQ records remain unprocessed (which may arise due to an invalid Acctno having been utilized in the REQ record), and error messages are printed out. In addition, it is necessary to process any remaining TRAFR for the last Acctno that was being processed, which TRAFR may have invalid Catnos, and therefore they remain to be processed even though the MAFI for that Acctno has been completed. Thus the wind-up 328

processes all of the succeeding TRAFI records for the same Acctno, which operation terminates upon a new Acctno appearing for the TRAFI. Upon completion of the processing of all of the transactions for the last Acctno, the wind-up 328 completes whatever totals (such as the Catno totals and the final account total) that may remain, and it proofs these account totals of the Jrnl against the DDA balance, as explained below. When the last MAFI Acctno has been completely processed, the control steps to end-run 330 which completes the housekeeping operations on the various files to terminate the current run and bring in the next run.

When the program obtains a match of the MAFR Acctno and that of a REQ record (via test 310) or of the CYC range (via test 324), the program branches to test 314 to determine if there is also a match on the TRAFR Acctno. If not, test 320 determines if the TRAFR Acctno is greater than that of the MAFR. Test 320 proves NO where the TRAFRS for that TRAFI Acctno are not to be processed during the current CYC; e. g. the Acctno is outside the CYC range and is not one of the accounts specified by an REQ. Thereupon, the program proceeds with a loop to locate the TRAFR having the matching Acctno; this starts with a PUT 340 of the TRAFR, a GET 342 of the next TRAFR, a test 344 for end-of-file, the blank and flagged subroutine 305, and a test 346 to determine if the Acctno of the new TRAFR is the same as that of the preceding TRAFR (which is located in output register 182). If it is the same, a loop is formed back to PUT 340 to repeat the operation until test 346 locates a new TRAFI Acctno. When it does, the program loops back to test 314 to determine if there is now an Acctno match for MAFR and TRAFR. If there is not, the loop is again repeated until the match is found, or the TRAFR Acctno is greater than that of the MAFR, and the program then enters subroutine 316 to process the TRAFR and update the corresponding MAFR.

EOTF (MAFI Wind-Up, Fig. 8B). The EOTF subroutine is entered whenever the end of the TRAFI occurs. Initially, a test 350 determines if the Acctno

for the REQ record and MAFR are the same. If YES, the REQ switch is set 352 and program control continues (if the current MAFR is the name record 142) with the print-out 354 of the account name and Acctno, since this account receives a TR-Jrnl without any transactions for the CYC period. The program continues thereafter to wind up that MAFI account with PuT 356 the current MAFR and GET 358 the next one, which test 360 checks for end-of-file. If YES, test 357 determines if the account totals of the current Jrnl (the MAFR Acctno in output register 186) are in balance with the account's DDA balance (as explained below for test 460). If it is in balance, the subroutine exits to wind-up 328; if not, that exit is preceded by a print-out 359 of an error message.

If not EOMTF, test 362 determines if the Acctno remains the same. If it is the same, certain housekeeping operations have to be performed on YTD records, and test 364 determines if the current MAFR is a YTD type (from the identifier field 167). If it is not, the program loops back to PUT 356 the MAFR. If it is a YTD record, test 366 determines from the CYC flag 147 (stored in register 425 when the name record 142 is put out to file 22″, which register 425 is cleared upon a change in MAFI Acctno) whether the current CYC period is that for zeroing the YTD files, as explained below in connection with Figs. 8C and D. If it is the time to zero YTD, the program steps to operation 368, which performs the zeroing of the appropriate YTD field 168. 169 of the current MAFR and then steps to process 370 to zero the current-month field 168′, 169′ (which contains the previous month's figures) and the program loops back to PUT 356. If the current CYC period is not that for zeroing the YTD, from test 366 the program steps directly to process 370. This loop continues until test 362 indicates a different MAFI Acctno; the branch flow is via DDA-proof test 369 (and if NO, via print-out 371); if YES, to test 372 to determine whether the REQ switch is set. If NO, the branch is to test 350; if YES, the program proceeds to GET 374 the next REQ before going to test 350.

Whenever an end-of-file for the REQ record comes up, a switch (noted above for test 326) is set and the REQ Acctno in register 192 is set to the highest end of the CYC range. Thereby, when the program returns from operation 374 to test 350, the latter will prove NO because the REQ Acctno is necessarily greater than that of the MAFR. Thereafter, test 376 tests if the MAFR account numeral is higher than that of the REQ. If YES, an error-message print-out 378 is made, and the program proceeds via operation 374 to GET the next REQ, as described above. If test 376 proves NO, test 380 tests for equality of the MAFT Acctno and the CYC; if YES, the program branches to the loop beginning with print-out 354. If test 380 proves NO, test 382 determines if all the REQS and the CYC range have been processed. If YES, the program branches to wind-up 328; and if NO, the program branches to a loop that includes PUT 384 the current MAFR and GET 386 the next one, a test 388 for end-of-file, and a test 390 for same MAFR Acctno. If the Acctno is the same, the program loops back to PUT and GET MAFI records until a new Acctno is obtained, and the program then loops back to the beginning 350 of the subroutine. If test 388 is YES, the control branches to wind-up 328.

In operation, the Jrnl Run begins with obtaining an Acctno match between the name MAFR of an account and either the REQ or the CYC record (test 310 or 324). Thereafter, an Acctno match between the MAFR and TRAFR is obtained (or, if the account had no activity for that month, test 320 would find the MAFR Acctno greater than the TRAFR) and the program exits to subroutine 316 to process the MAFRS of that Acctno with the associated TRAFRS, if any. After this processing, control returns via switch test 318, which steers the control to different reenteries depending on whether the previous exit was due to an REQ or CYC match. If test 314 does not obtain an Acctno match for the MAFR and TRAFR, and the latter has the lower Acctno, the loop via PUT 340 through test 346 operates repeatedly to locate the required TRAFR Acctno. Similarly, if the MAFR Acctno does not match on REQ or

CYC, the loop of PUT 332 through test 338 obtains the next MAFI Acctno.

At the end of the TRAFI, after it has been processed, the program enters the EOTRF subroutine (Fig. 8B) to wind up the MAFI. If the current MAFR is the name record, a print-out 354 of the name data is made upon a match of the MAFR on the REQ or CYC (test 350 or 380). Thereafter, the loop of PUT 356 through operation 370 transfers the remaining MAFRS of that account to the update file with any processing that may be required such as the zeroing (368 and 370) of YTD and current-month totals. When the next Acctno is detected by test 362, the loop exits back to test 350 (via DDA proof test 369 for the Jrnl just completed and test 372). If there is no match on REQ or CYC, the loop (384-390) obtains the next MAFI Acctno. Finally, at the end of MAFI, the test 360 branches control (via DDA proof test 357 for the Jrnl just completed, or test 388 directly since there was no Jrnl then in process) to the TRAFI wind-up 328. If the MAFI should end before the TRAFI, the wind-up 328 processes the remaining TRAFRS for the last Acctno and completes the totals for the Jrnl therefor and proofs the totals with the DDA balance.

Processing TR-Jrnl. The processing of the TRAFI and MAFI files to produce the transaction journal (i.e. the subroutine 316, Fig. 8A) is illustrated in flow-chart form in Figs. 8C and D. In working storage 11, additional sets of registers are employed for this processing; namely, a YTD Cat-total register 400 having individual sections for income and expense (to store MAFR fields 169 and 168, respectively), a current-period Cat-total register 402 having individual income and expense sections (to store MAFR fields 169′ and 168′, respectively). Additional registers used for developing the summary sheet reports are Level-I total registers 404 and 405 for YTD current-period, respectively, and each having income and expense sections (as many such Level-I registers are provided as Level-I totals may occur in any particular chart of accounts; for example, several of these may occur in business accounts), and Level-II total registers 406 and 407

(for YTD and current-period, respectively, and each having income and expense sections) which accumulate the overall totals for each account. The Level-I and Level-II registers 404-407 operate only with the data reported in the summary sheet (Fig. 11), where the totals are those of validly coded items and not of invalid codes or non-coded items. Another register 408 contains the account total (Acct-tot) for the current period in income and expense and incorporates all items whether coded or not, validly or not.

The first operation 410 tests for equality of MAFR and TRAFR (since this subroutine may be entered from test 320 or test 314, Fig. 8A, and operates differently accordingly). If test 410 is YES, the name and address of the account from the name record 142 in input register 184 is set up, by print-out 412, on the blank transaction journal form (Fig. 10). Thereafter, the program proceeds to PUT 414 the current MAFR and GET 416 the next MAFR. The test 418 determines if this MAFR in register 184 is the end of file, and if not, test 420 determines if the new MAFR continues the same Acctno (i. e. determines if its identification field is other than that 145 for a name record). If YES, test 422 determines if the MAFR is a YTD record from identifier field 167, and if NO, the program loops back to PUT 414 and GET until a YTD record is obtained. (General-Title and Total Records 160 (Fig. 5D) are not utilized in this run.) When test 422 finds a YTD record, test 424 determines if this is the month to zero the YTD records (i. e. if it is the end of the fiscal accounting period as indicated by the cycle flags 147 for the current Acctno, which flags are stored in working register 425 after the name record 142 is put out to file 22′). If YES, the YTD fields 168, 169 of the MAFR in register 184 are zeroed 426 and the program proceeds to zero 428 the current-period fields 168′, 169′ in that same YTD record. If test 424 is NO, the program steps to operation 428 directly. If test 418 is YES, control branches to wind-up 328.

Thereafter, test 430 determines if the TRAFR and MAFR records are equal on Catno. If YES, test 432

determines if either MAFR flag 170 or 171 is set consistent with the Tranco. That is, the Tranco (check or deposit) of the TRAFR calls for a flat in MAFR field 170 or 171, and this test 432 determines if the flag is in that field of the MAFR. Thus, the test 432 determines whether the check writer has inserted a deposit Catno on a check or a check Catno on a deposit by error. If test 432 is YES (i. e. it finds that the flat corresponding to the Tranco is set, the program proceeds with print-out-436. The latter controls the print-out on the TR-Jrnl form (Fig. 10) of the current TRAFR; i. e. it prints out the TRAFR fields of the Catno, Chkno, the date, and the amount, and points the amount in the appropriate column depending on the Tranco indicating a check or a deposit. In addition, this control 436 initiates various accumulating operations in the working storage; that is, the amount field of the TRAFR is added to the previous YTD total (income or expense as is appropriate) for that Catno obtained from the MAFR record located in the input register, and the sum is stored in the appropriate income or expense section of register 400. The TRAFR amount is also accumulated in the appropriate income or expense section of register 402 with those of other TRAFRS of the same Catno. The Acct-tot register 408 is also incremented in its appropriate income or expense section by this transaction amount.

To complete the processing of the current TRAFR, and to identify it as processed, a flag is inserted in the FLG field 437 (Fig. 5B) of that record, and since it is now completely processed it is PUT 438 to the output file 22′. If test 432 is NO, an invalidly coded TRAFR is indicated by a print-out 434 of an error message to that effect on the TR-Jrnl (Fig. 10). In addition, the TRAFR data is printed out, as explained above, and the amount is accumulated only in register 408 since the Catno is invalid; a "processed" flag is inserted in FLG field 437, and the program steps to PUT 438, followed by GET 440.

After the next TRAFR is obtained, test 442 determines if it is the end-of-file. If YES, the subroutine exits to the EOTF subroutine (Fig. 8B) at entry point

356; since the current MAFR requires no further processing it is PUT 356; the next MAFR must be obtained and it and the rest of the MAFI processed. If test 442 is NO, test 444 determines if the Acctno field of the new TRAFR is blank (which field would have been blanked during the preceding month's Jrnl Run (see 448 below) if that TRAFR had been flagged the month prior to that. If test 444 is YES, the TRAFR is not a record to be processed and the program loops back to entry 438 to PUT and GET the next TRAFR. If test 444 is NO, test 446 determines if the TRAFR is flagged (in its FLG field 437), and if YES, control 448 proceeds to blank the Acctno field, and the program loops back to entry 438.

If test 446 is NO, test 450 determines if the current TRAFR is continuing with the same Acctno (i. e. whether it has the same Acctno as that in the TRAFR output register 182). If YES, test 452 determines if the same Catno is continued, and if YES, the program returns to test 432 to determine if it is a valid Catno for the Tranco and to process it accordingly. If test 452 is NO, a number of processing operations 454 are handled. That is, the Cat-totals in register 402 are printed out in the next line of the TR-Jrnl and marked as a total (e. g. with the three asterisks representing such a total in Fig. 10); the totals in registers 400 and 402 are also transferred to the corresponding fields of the MAFR input register, and then registers 400 and 402 are blanked. Thereafter, the program returns to entry 414 to PUT the current MAFR and GET the next one, and to repeat the above described loop.

When test 450 detects a change in the Acctno of the TRAFI record, the program branches to control 456 (Fig. 8D) to perform the same operations as those of process 454, and thereafter, in control 458, the Acct-tot in register 408 is printed out on the TR-Jrnl report. Then test 460 determines if that Acct-tot of the current TR-Jrnl is the same as the current-period totals of the DDA bank statement of the same Acctno. This operation is performed by comparing the contents of register 408 with those of the debit-credit working register 401 (to

which are transferred the fields 150 and 151 of record 148, Fig. 5C, for the same Acctno prior to that record having been PUT 414). This comparison may be performed by subtracting the contents of register 401 from those of register 408 and checking for a zero balance. If test 460 is NO, there is an error-message print-out 461, and at the same time the register 408 is blanked since it is not zero, and the program steps to subroutine 462. If test 460 is YES, the program steps directly to subroutine 462.

The control operations of subroutine 462 correspond generally to those described above and identified as 414 through 428, except that the subroutine 462 is performed at the termination of the TRAFRS for the Jrnl currently being processed, and it is only necessary to wind up the MAFRS of this Acctno. At this time, the MAFR records for the current Jrnl's Acctno are all processed in the same fashion to zero YTD records if it is the end of the fiscal period, and to zero all of the current-period fields in those records (since these fields correspond to the preceding month's sub-totals). When the test for same Acctno (corresponding to test 420) detects a change in Acctno in the MAFR, a branch exits from the subroutine 462 and back to test 318, Fig. 8A (as indicated by the connector circle). The branch from the test for a YTD record (corresponding to test 422) is a return loop to the beginning of the subroutine, as is the step from the operation of zeroing the previous current-period field (corresponding to control 428), and the latter loop back is indicated by the connecting line in the drawing.

When test 430 finds inequality of the Catnos for the TRAFR and the MAFR, the program branches to test 478 (Fig. 8D) to determine if the Catno for the TRAFR is greater than that for the MAFR. If YES, there are no current transactions for that MAFR and the program branches back to the entry 414 to PUT the current MAFR and GET the next one. This loop continues until test 430 finds equality, or until test 478 finds that the Catno of the current TRAFR is less than that of the new MAFR. Thus, when test 478 is NO,

an invalid Catno in the current TRAFR is indicated, and the program steps to print-out 480 (which is similar to control 434) to print the TRAFR data on the current Jrnl and to mark it as an invalid Catno, and to handle that TRAFR as described above for control 434. Thereafter, a predefined process or subroutine 482 establishes program control. It is made up of operations which are similar to the operations 438 through 450, except that the subroutine 482 is concerned with handling invalid Catnos and with completing the processing of them until a new Acctno is obtained, which provides an exit for the loop in which the program is operating, to control 456. If the Acctno is the same, subroutine 482 exits to test 452′, which (like test 452) determines if the Catno is the same; if YES, the control loops back to print-out 480 for another invalid Catno; if NO, print-out 454′ (like 454) completes the operations for the previous TRAFR, and control returns to test 430 to determine if the Catno of the new TRAFR is valid.

When test 420 is NO (i. e. the new MAFR contains a change in Acctno), the program branches to test 484, which determines if the Acctno for the input TRAFR is the same as that of the previous MAFR (which now has been PUT and therefore lies in the MAFR output register 186). If test 484 is NO, the program branches to subroutine 486, made up of operations which are generally the same as the operations 456, 458, 460 and 461. That is, subroutine 486 performs the remaining operations that are necessary to complete the printing of the current Jrnl, and to blank the appropriate working registers. In subroutine 486, the test corresponding to test 460 checks to determine whether the Acct-tots (register 408) for the TR-Jrnl are in balance with those of the DDA bank statement (fields 150, 151), and if YES, the overall processing subroutine 316 in Fig. 8A (of which subroutine 486 is a part) exits and returns to the initial control section of the program at test 318. The same exit to test 318 occurs following the printing of an error message corresponding to control 461.

If test 484 proves YES (i. e. the Acctno of the input TRAFR is the same as that of the previous MAFR), the program steps to 488 to print the data of that TRAFR on the current Jrnl and to mark it as invalid, to accumlate it in the Acct-tot register 408, and to flag it as "processed." Thereafter, the program moves into subroutine 490 (which is generally similar to subroutine 482, employing operations similar to 438 through 450); its function is to complete the handling of all of the remaining transactions having the same Acctno as that of the previous MAFR (i. e. the current Jrnl) and to complete that processing. The subroutine is a self-contained loop from which the exits are either via the EOTRF test (to subroutine EOTRF 350, Fig. 8A) or via the test finding a different Acctno in the TRAFR, which calls for an exit to test 318.

If test 410 is NO (corresponding to an entry from test 320), there are no TRAFRS for that MAFI Acctno during the current period. Print-out 492 prints the name and address, and control steps to test 460 to check the zero Acct-tot against th DDA bank statement.

In operation, the processing of the TR-Jrnl starts with a print-out 412 (Fig. 8C) of the account name and address from the name MAFR 142. Thereafter, loop 414-422 obtains the next YTD MAFR for the same Acctno, and the appropriate fields thereof (at least the current-period fields 168′, 169′) are zeroed. A match between MAFR and TRAFR is obtained (test 430), the TRAFR Catno is checked (test 432) for valid code, print-out 436 sets up the TRAFR data for a valid Catno on the Jrnl (print-out 434 for an invalid Catno), and Acct-tot register 408 is accumulated by the TRAFR amount, as well as the registers 400, 402 for a valid Catno. Thereafter, loop 438-448 obtains the next TRAFR to be processed (i. e. not previously processed and therefore not flagged and Acctno not blanked), and if the same Acctno and Catno, there is a loop back via tests 450, 452 and 432 to repeat the processing (print-out 436 or 434) on the TRAFR data, and so on. Where the next TRAFR has a different Catno, print-out 454 steps up the Cat-total on the Jrnl, the totals in registers 400, 402 are placed

in the corresponding MAFR fields, and these registers are blanked. Thereupon, the control loops back to PUT 414 to GET the next MAFR, if any, for this Acctno, and repeats the processing for the current TRAFR which does have the same Acctno (as established by test 450). Where all of the TRAFRS of the Acctno have been processed, control branches (from test 450) to print-out 456, which performs the Cat-total operations. Thereafter, print-out 458 prints the Acct-tot from register 408, which totals are used to proof (test 460) the totals of the DDA bank statement for the same current period, and subroutine 462 winds up the MAFRS, if any, for the Acctno of the Jrnl just completed. When there is no match on Catnos (test 430), test 478 determines if there are no TRAFRS for the MAFR Catno, or if the TRAFR Catno is invalid. If the latter, loop 480, 482, 452 processes the successive TRAFRS with invalid Catnos until the next Catno is found. Similarly, where the MAFRS terminate for a particular Acctno (test 420) and TRAFRS remain for that Acctno, the latter have invalid Catnos and loop 484-490 processes them.

Summary Sheet Run. The Summary Run 108 makes use of the MAFI 106 as updated by the Jrnl Run 100. There is no further updating of the MAFI, so there are no file outputs in this run 108, and the outputs are the printed summary sheets (Fig. 11 or 12) that present the record-keeping data and analysis developed from the customer's transactions and chart of accounts. The TRAFI is not required in this run, since all of its data has been extracted during the Jrnl Run and utilized to update the MAFI.

Different forms of summary sheets (e. g. those of Figs. 11 and 12) are utilized, depending upon the character of the account; for example, a personal account will generally require a simpler form of record-keeping and a business or professional account a more elaborate form of record-keeping and analysis. It has been found that agricultural accounts have special characteristics which may call for a somewhat different form of summary sheet, such as that of Fig. 12. In this format, the same Catno may be used for both expenses and income.

An example of this is in crops, or any particular variety thereof, where the farmer's record-keeping is more helpfully presented to him if he can identify both his expenses and his income in connection with the same crop activity. Thus the use of the same Catno for both has been found to be helpful. This form of summary sheet (Fig. 12) can also be used for personal and business accounts if desired.

In a personal account, it has been found to be sufficient to provide two general areas of record-keeping, namely, one for income and the other for expenses, with individual totals for each area. If a customer desires, the income can be broken up into more than one level (e. g. taxable and non-taxable income) with totals provided for each, as well as an overall income total. Similarly, the expenses can be broken up (e. g. deductible and non-deductible), with Level-I totals, as well as the overall Level-II total therefor. In a business type of account, for example, a format may consist of an area for income with a Level-I total, an area for cost of income with a Level-I total therefor, and a Level-II total in the form of "Gross Profit" consisting of the difference therebetween, with the foregoing followed by another area for Overhead Expenses with a Level-I total therefor, followed by another Level-II total in the form of Net Profit or Loss, representing the difference between the first Level-I total and the total of overhead expenses. Various other formats of business record-keeping summary sheets may be employed, and with the transaction data supplied and the chart of accounts in the system of this invention, a balance sheet summary may be provided.

For purposes of distinguishing between the different classifications or types of account, the name record 142 and each account's master sub-file 140 (Fig. 5C) contains a system-flag field 146 which identifies the type number of the account. In performing the summary run it may be restricted at any time to a single type of summary sheet format (e. g. personal, business or agricultural, Fig. 11 or 12) since, for efficiency and reasons of cost, only a single output printer may be available. For this reason, the cycle record specifying the account

numbers to be processed at any time would specify the particular account type number (Typno) to be handled during a run. This typno is stored in a working register 500. Alternatively, a console entry or punch card may be used to establish the Typno to which the run is to be restricted at the time that the operator sets up the particular summary sheet to be run through the printer.

The same cycle range 101 and the same requests that determined the Jrnl-Run processing are employed in overall control of the Summary Run, and the Acctnos of the cycle range and the requests are established in the working registers 190 and 192. The Summary Run starts with GET 502 the MAFR, and thereafter proceeds with GET 507 the cycle record, and GET 508 the request record to establish the latter in registers 190 and 192. The input control section of the Summary Run, made up of operations 507-512 and 522-526, is generally the same as the corresponding input control operations of the Jrnl Run (Fig. 8A) and are referenced by the same numerals except that in the Summary Run they are in the 500-series while in the Jrnl Run they are in the 300-series. Details of the operation of these portions of the Summary Run will be readily understood from the corresponding description of Fig. 8A.

When test 510 finds equality of the MAFR with that of the REQ record, the REQ switch is set 512; thereafter (or after test 524 finds the Acctno within the CYC range), the program proceeds with test 528. The latter determines if the system flag in field 146 of that MAFR is the same as the preset Typno stored in register 500. If test 528 is NO, test 530 checks the setting of the REQ switch, and if it is set, an error-message printout 532 indicates that the Acctno of the REQ card did not have the proper system flag. Thereafter the program returns to perform the operation to GET 508 the next REQ record, and the process is repeated. If test 530 is NO (the Acctno is within the CYC range, but it is not the type of account (Typno) requested in register 500), the program branches to loop 548 (GET 550, EMOF test 552 and same-Acctno test 554) to find the next MAFI Acctno.

If test 528 finds the proper system flag corresponding to the Typno, set 534 determines if the Typno corresponds to a business account. If YES, the program branches to the subroutine 536 for processing business summary sheets. If test 534 is NO, a test 538 determines if the Typno is for personal summary sheets. If YES, the program branches to subroutine 540 to process the records for the personal summary sheet. If test 538 is NO, the program proceeds with subroutine 542 to process the agricultural type of summary sheet. All of the subroutines 536, 540 and 542 exit to test 544 to determine whether the processing had originated from a REQ record or the CYC range, and the program returns to re-entry points 510 or 508 accordingly.

If test 526 determines that all of the Acctnos specified by the REQ and CYC records have been processed, the program proceeds to the end run 546; its operations consist of the usual wrap-up housekeeping together with printing out any REQ records that remained unprocessed upon coming to the end of the MAFI (such requests necessarily being invalid). If test 526 is NO, the program enters the loop 548 to GET a new MAFI Acctno. That is, loop 548 is entered under conditions of the current Acctno not being within the CYC range nor specified by a REQ, and it is necessary to run through the MAFR of the current Acctno until test 554 finds that the next one is obtained, and the loop exits with control returning to test 510.

The subroutine 540 for processing personal summary sheets is shown in Fig. 9B. It is assumed that the RK summary statement may take the form shown in Fig. 11, in which the amount data are to be supplied, but not percentage data (the latter is described with reference to Fig. 9C). The initial operation 556 consists of printing on the summary sheet 110, in the appropriate areas 120, 122, the name and address together with the Acctno, the month and year of the period for the summary sheet, and any other required data that may not be supplied by the name record 142 then currently in the MAFR input register 184. Thereafter, GET 558 brings the next MAFR into the input register 184, which record

is the cred-deb record 148. This record is handled by a loop 559 that includes the series of record-identifying tests 560 through 570, and it fails all of these tests (except same-Acctno test 562, which it passes), and the branch from the last test 570 returns the loop to GET 558, whereby the next MAFR is obtained. Generally speaking, this next record is a General-Title record 152 which passes tests 562 and 566 (and fails the tests 560 and 564), and the program branches to a print-out 572 of the title record portion 165 (i. e. the Catno and description, such as "100-Income" shown in the first row of Fig. 11 in columns 124 and 126. Thereafter, control returns to GET 558 the next MAFR. This next record is usually a YTD record 153, which is identified as such in test 564, from which the program branches to control 574 to accumulate the YTD amount of this record in register 404 and in the income or expense section thereof, depending on the identifying flags in fields 170 and 171 of the YTD record (if the Fig. 12 format of summary sheet is used, the YTD MAFR may contain both income and expense amounts, both fields 170 and 171 would have flags, and both sections of register 404 would accumulate the corresponding amounts from fields 169 and 168). Likewise, the current-month amount of the YTD record is accumulated in register 405 and in the corresponding income and/or expense section thereof. In addition, the accumulation takes place in the Level-II registers 406 and 407 in the same fashion as that described for the Level-I registers. By way of example, the Level-I registers 404 and 405 may initially accumulate taxable income and thereafter non-taxable income and, subsequently, deductible and non-deductible expenses, while the Level-II registers 406 and 407 accumulate total income and, subsequently, total expenses. Print-out 574 also calls for the printing of this YTD record; the title name or description 163 is printed in column 126, together with the Catno field 161, and the current-month amount and YTD amount fields 168, 168′ (or 169, 169′) are printed in the appropriate columns 128 and 130. All of the data to be printed out comes from certain specified fields of the YTD record and go to

specified locations on the summary sheet, so that routine procedures may be used to perform the print-out 574. Thereafter, the program returns to GET 558 the next MAFR, which may be a second YTD record 154, and the processing thereof is similar to that described.

After a first group of YTD records are processed, a Level-I total record 155 may be the next MAFR in input register 184, and this record is detected by test 568 and the program branches to print-out 576. Here the contents of the record are printed out. That is, the Catno 166 and title name 165 retained in this record (Fig. 5D) are printed out as well as the contents of the corresponding portions of working registers 404 and 405. In order to determine which section (income or expense) of each register 404 or 405 is to be printed out, a simple procedure may be employed; the income section of each is tested for All-Zeros, and if not such the income section is printed out, but if it is All-Zeros, the expense section is printed out. The control 576 thereafter blanks the Level-I registers 404 and 405 and the program returns to GET 558 for the next MAFR. In a similar fashion, a new section of the summary statement may start with a General-Title Record (corresponding, for example, to "120-Expenses" in Fig. 11) and the program operates in the manner described to print out this Catno and title and to process the succeeding YTD records. Thereafter, an additional Level-I total may be provided and processed in the manner described.

Where a Level-II total record 157 is provided in the chart of accounts, this record is identified in test 570 and is processed by control 578. The latter prints out the Catno and title-name of the Level-II total record, as well as the contents of the Level-II working registers 406 and 407 (in a manner similar to that described above for the Level-I print-out), and the contents of the Level-I and Level-II registers are blanked. The program returns to GET 558 the next MAFR, which may be a new Acctno record that is identified by test 562, from which the program branches to control 580 for blanking all totalizing registers 404-407 in order to ensure that they are in that condition with the termination

of the summary statement for the previous Acctno, and the program returns to test 544 (Fig. 9A) which leads to the proper re-entry for the input control section of this run. After all of the MAFI has been processed, test 560 detects the end-of-file record and the program returns to end run 546 for the wrap-up.

In operation, the Summary Run provides a complete record-keeping report in accordance with the customer's own individual charts of accounts, which controls the generation of the customer's summary report on a form that is blank except, for example, for the captions of the columns and a suitable heading. The customer's own master sub-file (his chart of accounts) determines the record-keeping system, and the format and descriptive titles on the summary sheet. The Summary Run operates to print reports that may be different for each customer. The master sub-file controls the operation of the run in that the latter comprises a series of tests for recognizing the different types of MAFRS (YTD, title or total records) and a set of controls associated with each test for producing the appropriate print-out, register accumulation and totalizing. The customer's title records 160 are selected and serve to provide headings for different sections of the report and are used to label the particular record-keeping system chosen by the customer. The customer's total records 155 or 157 are selected and serve to complete the definition of the customer's record-keeping system; these records initiate different types of totalizing control operations built into the Summary Run to report the customer-selected totals at the required levels. The YTD records supply category sub-totals, which were accumulated in the Summary Run and are printed out in the Summary Run at the same time that they are further accumulated for the totals at different summary levels. Thus, the mechanization of this system makes it possible for each customer to select his own chart of accounts of categories, of a record-keeping system and of report captions. This selection consists essentially of identifying his own areas of financial activity and describing them himself for the category breakdown and names, or of choosing categories

and names from a list that may be composed for his convenience. The particular record-keeping system to be used for the reports may also be individually selected. Thereafter, the customer merely categorizes each transaction in accordance with his own chart, and he may revise any part of that chart whenever he desires. The actual summary report may be generated on a largely-blank form and compactly and individually reports the customer's financial transactions.

The subroutine 542 for the agricultural summary sheets is generally the same as that described for the personal summary sheets (Fig. 9B), with certain minor modifications. For example, the summary sheet format found most useful for the agricultural report is of the type shown in Fig. 12, wherein both expenses and income can be applied to the same Catno. In this case, the fields 168, 169 (168′, 169′) both carry category totals, and the accumulation controls 574, 576 for these YTD records are directed to both the income and expense sections of the Level-I and Level-II registers 404-407, rather than in just one section as described above for the personal summary sheet. In this system, a farmer may select his own chart of accounts, and the report print-out is composed accordingly on largely-blank forms.

In connection with business reports, more detailed accounting analysis is generally desired, and this analysis may all be supplied with the MAFI chart of accounts of any business and with the Catno data supplied with the original transactions of the business. By way of example, the processing subroutine 536 for business summary sheets may take the form shown in Fig. 9C, where parts corresponding to those described with respect to 9B are referenced by the same numerals, with the addition of a prime. Initially, print-out 556′ sets up (as described above for Fig. 9B) the name and address of the account on the summary sheet (of the type illustrated in Fig. 11, in which the percentage columns 582 and 584 for current month and YTD are employed. The next control 590 consists of saving the file address in file 20″ of the start of the master sub-file for the current Acctno. This address is then available, since it corresponds to the

beginning of the current name record then in the input register 184 (and can be obtained from the computer's file address register, knowing the size of the block of data read into the MAFR input register 184). This STRT-ACCT is inserted in a working register 592.

The next control 594 GETS the next MAFR, which is the cred-deb record 148, identified as such in test 600, and since it is not used here, the program then loops back to GET 594, the next MAFR. This record will usually be a title record 152, and is recognized again as such by test 600 when the program loops back again to GET 594 the next MAFR. This MAFR ordinarily will be a YTD Catno for income, which will be recognized as such by test 602, and the program passes to control 604 to accumulate the YTD and current-period income amounts in an additional register 606, similar to the Level-I and Level-II registers, and used for accumulating the total income for valid Catno items, and as a base for computing percentages for the remainder of the account. Any other base may be accumulated for this purpose; it has been found that this total of income is one which has broad acceptance and meets the needs of many customers. The customer's master sub-file may incorporate an extra flag in field 170 or 171 which may be used by test 602 to identify the percentage base field (income or expense), and the loop operates to accumulate all such records until test 598 initiates a branch to control 608.

Thereafter, the program loops back to GET 594 the next MAFR, and this processing of successive income Catno records proceeds in the manner described above until the end of the income Catno records is reached and detected by test 602, which corresponds to the condition of register 604 having the complete accumulation and the proper base for computing percentages. This approach relies on a uniform procedure used in setting up charts of accounts, that all initial records correspond to income records, which in turn are followed by expense records. Where a different chart of accounts procedure is used, such as that corresponding to the summary sheet of Fig. 12, or where different areas of expense may interleave areas of income, an alternative procedure can be used

for calculating the percentage base, as noted above in the use of a flag to identify base records. If the test 602 identifies the end of income Catno records, the program branches to operation 608 for the next stage of the processing. Similarly, if a new Acctno is detected by test 598, the accumulation likewise ends and the branch to operation 608 takes place; and similarly if test 598 finds the end-of-file.

The operation 608 uses the STRT-ACCT address in working register 592 for the next GET 558′. In effect, the read heads on the input file 20″ are reset to go back to the first record of the Acctno whose percentage base was just accumulated in register 606. GET 558′ and the series of tests following thereafter that form a loop 559′ all correspond to similar operations and tests in the subroutine of Fig. 9B, and the parts corresponding to those described above are referenced by the same numerals with the addition of a prime. As described for Fig. 9B, the first record to be processed is the first General-Title record 152, which is detected by test 566′ and printed out by operation 572′. Thereafter the YTD record 153 is detected by test 564′, and operation 610 accumulates it in the Level-I registers 404 and 405, and also computes the percentages of these amounts on the basis established in the two sections of register 606. Thereafter, operation 612 prints out the category record with the appropriate current-month and YTD amounts being printed in the corresponding columns 128, 130 of the summary sheet of Fig. 11 and the corresponding current-month and YTD percentages being printed in the associated columns 582, 584. Thereafter, test 614 determines if the current YTD record is an income record. If YES, its amounts are added to the appropriate Level-II registers 406 and 407, and if No, its amounts are subtracted from the corresponding Level-II registers 406 and 407. This net accumulation in the Level-II registers 406 and 407 provides a running total, for example, of the gross profit, with the income being incremented and the expenses or costs of that income being decremented. From either control 616 or 618 the program returns to GET 558′. When a Level-I total record 155 is detected

by test 568′, control 620 computes the percentages of the two totals in registers 404, 405 on the bases established in the two sections of the register 606, and print-out 622 prints on the summary sheet the total Catno, the description, and the Level-I totals established respectively in registers 404 and 405 and the corresponding percentages; the Level-I totals are blanked. The next MAFR is obtained and the process continues, depending upon the type of record, in the manner described, and when a Level-II record is detected by test 570′, control 624 computes the Level-II percentages, using the amounts in registers 406 and 407 and based on the totals established in the two sections of register 606. The Level-I totals are also blanked at this time. Print-out 626 prints the Level-II total, the Catno, its description, and the Level-II percentages, and blanks the Level-II totals. Thereafter, test 562′ detects a different Acctno in a succeeding MAFR and control 628 blanks all of the total registers and the percentage-base register 606, and the program returns to 544 (Fig. 9A) to process the next account. If the end of MAFR is detected by test 560′, the program branches to end-run 546.

In operation, the controls 594 through 604 are connected as a loop 605 to develop the base of percentage computation. This loop 605 operates as a preliminary to the remainder of the processing of a particular account, and after the percentage base has been fully accumulated in register 606 by control 604 for a particular account, the control 608 resets the address of the input file 20″ to the start of that account. Thereafter, loop 559′ operates to process the successive MAFRS of that account's sub-file to print out the various areas of the summary sheet and to accumulate and print out totals as defined in the total MAFRS of the sub-file, as well as to calculate and print out percentages on the accumulated basis in register 606. The Level-II registers 406, 407 are used to accumulate gross profit as the difference between income and expense.

This invention is not restricted to any particular number of levels of totalizing. It has been found that a Level-II control is generally desirable for presenting a major

or grand total of two or more Level-I or intermediate totals. These total levels may be readily specified in setting up any chart of accounts. In addition, a third type of level is often desirable for the purpose of showing differences between other totals (e. g. for profit and loss). That is, a Level-III total record is inserted in any chart of accounts by specifying a particular identifier therefor, which is recognized by a particular test (similar to test 568′ or 570′) that is provided to generate a series of control operations (similar to 624, 626) in connection with Level-III register (similar to registers 406, 407) which is automatically incremented and decremented by suitable controls (similar to 614, 616, 618). The Level-III totalizing affords the flexibility of providing a net or difference between precedent sum totals of the Level-I or Level-II variety. Thereby, a net profit or loss may be furnished in the Summary Sheet Run, as described above. In addition, where it is desired to provide a balance sheet statement for a business, a Level-IV totalizing can be specified by a specific total record inserted in the chart of accounts. The operation performed likewise consists of an incrementing and decrementing, and the Level-III register (or another similar to it) is used. The Level-IV operation consists of testing the contents of its register for a zero-balance; if it is a zero-balance, it is printed out, and if it is not, the difference is printed out and the register reset. In a Level-III control, the register is not reset until a new account is indicated or until a Level-IV or -V control is called for. Another variation in the form of a Level-V control is used with incrementing and decrementing of the register in the manner described above; the Level-V control calls for a print-out at the specified level, and the register is reset. This Level-V is used to obtain a net cash flow at intermediate record-keeping levels, and has application, for example, in multi-branch businesses or in multi-farm agricultural accounts where the individual cash flow for each business or farm is shown on the account. The Level-III control, as distinguished from a Level-V, provides a register-total print-out whenever Level-III is called for, but it

does not reset the register. Each type of total control at any level is effective to reset all lower level registers.

Various modifications, in addition to those noted above, will be apparent to those skilled in the art from the above description. For example, in ordinary banking operations, a customer often makes a deposit incorporating a number of diverse items on the same deposit slip. It is not necessary with this invention that a separate deposit slip be used for each Catno. Instead, a separate Catno may be applied to each item on the deposit slip, and when the bank processes that deposit a separate TRAFR for each of the items associated with a different Catno is generated, and thereafter the system processes these machine records in the same fashion as described above. In a similar fashion, a check is sometimes written covering a number of different record-keeping items, such as a check to cover a credit card bill, where the general credit card may be applicable to a wide variety of charge-account items. For this purpose, the check may have printed areas for different items associated under the total check, and each such item is given a separate Catno in accordance with the customer's own chart of accounts. Here again this multi-item check may be processed by the bank into a separate TRAFR for each item within the check, whereby the customer's record keeping is fully and automatically processed.

The transaction journal may be used in place of the conventional bank statement by the addition to the Jrnl of the beginning and ending DDA balance for each account. With relatively minor modification of the system this combining of the two statements can be developed; that is, an additional record is provided in the MAFI for each account, which carries the account DDA balance for the beginning of each statement period, and the date associated therewith. At statement time, the TR-Jrnl is processed in the manner described and an accumulator register receives the beginning DDA balance and is incremented and decremented by each deposit and check, respectively, to obtain a final DDA balance which is printed out on the check and utilized as the beginning balance for the next statement period.

As noted above, the TR-Jrnl need not be a pre-printed form, but actually may be fully printed by the output printer as the run is performed. That is, the various headings on the Jrnl may be automatically printed out from a control operation specifying that the print-out is to be a journal, with the general format of the journal stored in a look-up table that controls the setting up of that report form in accordance with known techniques. The individual captions in each column and the sizes of the columns likewise can be set up in a look-up table, with the particular specifications of each account (in its master sub-file) being controlling as to which section of the look-up table controls the setting up of the journal format. Thereafter, in other respects the development of the journal report is in the manner described above, with the particular locations of the amounts to be printed out being established by the look-up table controls. In a similar fashion the summary sheet can likewise be developed from a blank form and its format established in a look-up table, with provision for different formats in accordance with the record-keeping system called for by the customer's chart of accounts. The use of the chart of accounts of the MAFI for this purpose will be readily apparent to those skilled in the art from the foregoing description.

In addition, the transaction journal and summary sheet runs may be combined into a single run. For this purpose, separate printers may be used each carrying preprinted journal and summary sheet forms, or a single printer may be used with an unprinted form (which is composed in the manner described above) to present the journal format or the summary format called for by the customer's chart of accounts as well as by the particular section, journal or summary sheet, of the run being operated at that time. For this purpose, the journal run is performed generally in the manner described above, except that the updated MAFI file is written out on a working file that takes but one account's output data as it is processed by the Jrnl section of the run. Thereafter, the updated MAFI on the working file is utilized to complete the Summary portion of the run to print out the

summary sheet in the manner described above. As each record from the working file is processed in the Summary Run, it is then written out to the update file 22″ for the MAFI, as described above, to produce a combined updated file. Another approach for a combined journal and summary run employs a wide, pre-printed sheet which has the journal format on one half and the summary format on the other. As each active Catno of the Jrnl Run is processed, the summary for that active Catno is then printed out on the summary part of the report. That is, as the Jrnl is processed for any Catno, all the data for the summary print-out exist in working storage at that time, as will be apparent from the description of Fig. 8 above. This process is repeated for each active Catno; in order to have a parallel presentation of corresponding rows of the two reports, the data for any inactive Catno are not printed out. The general titles may be printed out and spaces left for corresponding rows on the transaction journal without destroying the neat presentation of that report. The totals may be omitted from the summary sheet, or instead they may be accumulated and printed out, but generally would be limited to totals for the active Catnos. As a supplement to this monthly, abbreviated summary statement, periodically (such as on a semi-annual basis) a full summary statement is provided in the manner described above for Fig. 9.

For the purpose of saving master file storage, one may modify the MAFI format from that shown in Figs. 5C, D and E. That is, for certain Catnos, such as those which experience shows are most commonly used and in which uniform descriptions are accepted by customers, the descriptive portion of the Catno may be omitted from the MAFR and stored instead in a look-up table. The MAFR for that Catno carries a flag instead of the description, and the flag during the Summary Sheet Run calls for an entry into the look-up table at the proper Catno for reading out the description to be printed. Though this can be done with all of the Catnos, generally for versatility in meeting the varied needs of businesses and personal financial record keeping, it is desirable also to make provision for the storing of specific descriptive titles in the

MAFI, as described above. Even where the pre-assigned titles are used for Catnos, and they are stored in a look-up table, nevertheless the customer can be afforded the versatility of selecting his own chart of accounts from an overall category listing. In the pre-assigned system, if a customer does not wish to utilize the pre-assigned description, he may still employ the same Catno and supply his own description; in the absence of the aforementioned flag, the look-up table is not entered and the customer's own choice of description is printed out instead. It has been found desirable in many cases to employ a combination of pre-assigned descriptions with the flexibility of customer-chosen descriptions. One use of such a system is for purposes of information retrieval of the pre-assigned categories; certain classes of accounts (e.g. farmers dealing with certain classes of crops or livestock) would have total data in the Catno types of MAFRS that could be extracted and analyzed on a statistical basis to provide valuable interpretative data of a particular region or community. Other examples of the use of such systems are to determine what the general population is spending for medical expenses or housing, and the like.

In the processing of accounts at the cycle period, instead of processing them by a specified range of Acctnos as described above, the cycle flag 147 may be used. Thereby, at each particular Jrnl and Summary Sheet Run, the operator need only specify a particular cycle flag, and the operation of selecting the proper account is by way of a match on the cycle flag rather than determining whether the Acctno fell in the specified CYC range.

In Fig. 13, a top view of a check imprinting device 640 is shown, with parts broken away to show the use of a customer service or credit card 642, which is used to develop certain portions of the check. The service card 642 may be a plastic disc of the conventional form used for credit cards, in which raised imprinting characters are provided for the payer's bank name 644, payer's Acctno 646, the bank routing number 648, and payer's name 650. This credit card is positioned at a predetermined location on the printing bed 652 by guides 654

which position the various edges of the card 642. A keyboard 656 is provided having slidable keys 658, each movable in a slot 660 and connected by appropriate linkages (not shown) to an individually rotatable number wheel 662 having raised characters for imprinting. A bank 664 of such keys 658 and associated wheels 662 is used for entering the amount of the check in dollars and cents. A second bank 666 of similar keys 668 and wheels 670 is used for entering the Catno of the check. A set of imprinting wheels 672 is readily adjustible to present the date of the check, and a semi-permanent template 674 contains the name and account number of the payee organization, as well as the name and transit number of the payee bank. The check writer 640 operates in a fashion similar to the conventional credit card imprinter, in which the credit card is inserted in the guides 654, the position of wheels 672 is adjusted to enter the date, keys 658 are adjusted to enter the amount of the check in wheels 662, and keys 668 are adjusted to enter the Catno in wheels 670.

Positioned on top of the bed 652, service card 642 and wheels is a multi-leaf document with interleaved carbons, such as is commonly employed with credit card imprinters. The hinged head 676 of the imprinter moves down over the printing bed 652 and positions the document 678 therebetween. The head 676 may contain a printing roller (not shown) which is connected to a handle 680 slidable in a slot 682. Movement of the handle from left to right through the slot 682 applies roller pressure to the paper document to receive the impression from the raised lettering of the service card, the template 674, and the number wheels 662, 670 and 672. Thereby, a document is printed which may be used as a machine-readable record; that is, the type fonts of all of the raised lettering on the service card 642, the template 674 and the number wheels are chosen to be of suitable special type for optical or, if desired, magnetic-ink reading devices. The printed checks developed by the imprinter 640 have their transaction fields at specified locations for a document reader 16 to handle and to transfer into suitable combinatorial electrical signals. This imprinter 640

may be used by sales organizations in place of the usual charging systems. Thereby, a machine-readable document is developed directly by the writer of the check, with the Catno entered in machine-codable form when and where the check originates.

The document 678, when in the form of a check, would be pre-printed to carry the usual "Pay to the Order of" information at an appropriate place adjacent to the template 674, as well as the signature line and other appropriate data. Thereby, the bank check that comes out of the printer 640 is complete both as a machine-readable record and as a check. For such purposes the template 674 need not be employed, but it is preferred in order to carry the data required for automatic processing of the payee Acctno and payee's bank transit number. With these machine-readable records, the check serves the dual function of a debit against the account of the credit-card holder as well as a credit to the business (payee) extending the credit. Such a check (or credit-card receipt) would be handled in the same fashion as described above when treated as a debit to be charged against the payer's account, and would be processed for account balance and record-keeping purposes in the manner described above (Figs. 2 and 3). In addition, this check is used as a credit transaction record for purposes of automatically crediting to the payee's account as though it were a deposit slip, in the same manner as described above for such deposits. For record-keeping purposes of the payee's account, a "credit" category code field can be added at a specified machine-readable location associated. for example, with the template 674. Thereby, all of the information for automatic record keeping of the payee's account is also provided on this "check." Accordingly, the imprinted check document 678 provided by this device 640 is a uniquely constructed machine-readable record in that it contains, in machine-readable form, the information provided by template 674. That is, the check carries data fields 677 and 675, respectively, for the payee's account number and that of his bank (with the appropriate routing information) so that it can be processed automatically as a machine-readable document for

the payee Accordingly, the check assumes a double character for automatic processing; in addition to serving all of the functions of previous checks, it also serves as the equivalent of a deposit slip, since the data required for routing to the payee's bank and for posting to the payee's account therein is in machine-readable form on the check. The complete processing can be performed without composing additional documents as is presently required and without the manual labor and successive handlings associated therewith, each of which often results in the entry of errors on hand-composed documents. The large amount of labor required by banks to compose the machine-readable records is eliminated, and the responsibility for accurate entry of the machine-readable data fields is placed in the hands of the originators of the documents.

Similarly, a check imprinter 19 of the type shown in Fig. 13 is adopted for use by the bank customer in his own establishment for writing checks directly with the RK Catno directly on the check in machine-readable form. Where the device 640 is used by the payer to write his own checks, the template 674 is not utilized, nor is service-card 642 required; for the document 678 is in the form of pre-printed checks of conventional machine-readable form carrying all of the data required for processing the check, and the device 640 serves to supply the remaining machine-readable character fields for the category number and the dollar amount. Thereby, the payer writes a check that carries in machine-readable form all of the data required for automatic processing through his own bank, so that it can be automatically posted to his DDA account and automatically processed for record keeping in the manner described above. For this purpose a simply constructed device is formed of the essential character of the device of Fig. 13, but small enough and compact enough to be carried in one's pocket in the same fashion as a conventional check folder. An embodiment of this device is illustrated in Figs. 14A and B.

In the pocket check-folder 690 of this invention, two body members 692 and 694 are hinged together and a stack of checks 696 is attached to the bottom member

694 and retained in position between the two members 692 and 694. Preferably, a fold-over flap 698 is hinged to member 694 and folds over the checks 696 and cover member 692 to prevent accidental imprinting. The flap 698 is also used to carry the conventional register book 699 in which the payee records the check data. Such checks are pre-printed and carry (as in currently available systems) machine-readable fields of the account number of the payer as well as the routing data of the payer's bank. In accordance with this invention, the pocket check-folder is constructed so that the payer completes the imprinting of the check as a machine-readable document for automatic processing in the system described above. For this purpose, the cover 692 is provided with two sets 700 and 702 of slidable tapes 704 each carrying a sequence of spaced numeric printing type characters 706 attached to the inner tape surface (e. g. each tape contains the numerals 0 through 9). A suitable number (e. g. three or four) of such tapes 704 form set 700 for the Catno and a suitable number (e. g. five or six) form set 702 for the dollar and cent amount. The raised imprinting type characters 706 may be of the rubber-stamp type carrying the ink in the imprinting type material; or alternatively, impact type paper may be used for the checks 696 in which the ink is formed in small, separated globules which are embedded in the surface of the paper, and which are burst by the type during the imprinting process. The type fonts are suitable for any particular document reader 18 that is used. These tapes carry the type characters 706 in reverse printing relation.

The check-folder and writer 690 is preferably formed of inexpensive plastic materials so that it can be discarded after a stack of checks 696 are used. The inside surfaces of the members 692, 694 and 698 are formed of a sheet of soft plastic material such as that used for conventional check folders. The bottom and flap members 694 and 698 are preferably formed of at least two layers of such plastic, whereby checks 696 and register 698 are neatly secured to the inside layer. The checks 696 are preferably secured to a stiff paper-

board or plastic backer which, in turn, is secured (e. g. by bonding) to the inside layer of member 694. Thereby, the checks are retained in predetermined relation to the type characters 706 for printing at predetermined areas 708 and 710 respectively associated with the Catno tapes 700 and the amount tapes 702. The plastic between the members 692 and 694 is grooved to form an integral hinge 712. A similar hinge 714 is grooved in the plastic material between members 690 and 698. The outer surface 716 of cover 692 is formed as a sheet of relatively stiff plastic material that is bonded to the inner plastic face. Extending across the width of the outer face 716 (Fig. 14B) are a series of deep depressions 718, which are spaced the width of each tape 704, so that each adjacent pair of depressions form a guide channel for a tape 704. Each tape is retained and slides smoothly between a pair of guides 718. A cut-out opening 720 in face 716 is formed between each adjacent pair of guides 718, and extends about half-way from near the upper edge to about the middle of the cover. The tapes 704 are formed as flexible, rectangular plastic or metallic members, and each has a projection or hook 722 at the upper end which extends through the opening 720 to be accessible to the finger nail of the user. Along the outer face of each tape 704 is a sequence of numeric characters that are uniformly spaced and arranged in positions directly opposite to the type characters 706. A window 724 in face 716 is formed as a clear plastic section at about the center of the face 716, and extends down from the lower edges of the openings 720 about the height of the numeric character. The length of each tape 704 is about half or less the width of the cover face 716. Each tape slides as a simple linear device in the channels formed by guides 718 up or down from a medial position at which, for example, the character "4" is positioned in the window 724 as illustrated in Fig. 14B. All of the characters may be positioned at that window either by running the slide up to half its length up the channel (with "9" in position at the window 724, in the extreme upper adjusted position), or down the channel to about half

its length (with "0" being in the window at the extreme lower position). The operator can quickly and easily make these adjustments by manipulating hook 722 on each tape (or by providing somewhat larger openings 720 and knurling the tape surface, whereby the user's finger can engage the tape directly to manipulate it). The section of the cover face 716 below the medial window 724 is preferably made opaque or diffused, so that the window 724 clearly presents and identifies the characters to be printed. In the inner, flexible surface of cover 692, two windows 726 and 728 are provided at positions diametrically opposite to the window 724 (and the corresponding window, not shown, for the amount tapes 702). The type characters 706 for the Catno tapes 700 can project through the window 726, and similarly, the type for the amount tapes 702 can project through the window 728.

In operation, the checks 690 have the pre-printed coded fields 730 in a suitable area of the check (e. g. along the lower edge), in a suitable manner, such as described above with respect to Fig. 4. The user may write his check in the conventional manner, except that the numerals for the Catno and the dollar amount are imprinted directly in machine-readable form. That is, the user sets the tapes 700 for the Catno by sliding them up or down to position the desired Catno in the window 724, and similarly, positions the tapes 702 for the dollar amount. Thereafter, the cover 692 is pressed down toward the bottom member 694 so that the inner face of the cover rests against the top check 696. The user slides his finger across, or individually presses down on, each character at the window 724. The stiff plastic cover 716 transmits the finger pressure to the flexible tapes 704, so that the corresponding type characters on the reverse sides of the tape project through the windows 726 and 728 and are impressed to print on the top check 696 at the areas 708 and 710, respectively. Thereby, the encoding of the check as a machine-readable document for automatic record-keeping at the bank is completed. When a check is not being written, the flap 698 folds over between members 692 and 694 to prevent any false imprinting.

Accordingly, with the check writing device 690, the ordinary bank customer may directly encode his check as a machine-readable document so that it may be automatically processed thereafter. The bank need not re-encode the document and thereby avoids the problem of making errors in its customer's records, and the relatively expensive manual labor of encoding such documents is largely eliminated.

The service or credit card 642 may be constructed to carry the Catno characters directly. That is, credit card 642 may be constructed with a set of number wheels or slidable number tapes, having a few raised numerals for imprinting. When the card is used, the owner adjusts the wheels or tapes to set up the Catno for the particular transaction. In addition, on the reverse side of the credit card a space may be provided for listing appropriate Catnos and category descriptions, so that the customer can readily enter the Catno for each transaction to which his credit card is applied. Thereby, the credit card operating company may supply the user of the card with a periodic record-keeping report of his transactions as well as with a record-keeping analysis and report thereof in the manner described above.

Various other forms of machine-readable records may be used with this invention. For example, punch cards or punched paper tape may be used to develop transaction records that carry data fields in machine-readable form (e. g. the fields described above with respect to Fig. 4).

This invention is not limited to use with demand-deposit banking accounts; the record-keeping may be performed separately from any banking operations and, as noted above with respect to Fig. 13, the record-keeping system may be applicable to credit-card accounts in a similar fashion. The RK system of this invention may be fully integrated with the DDA system. For example, the DDA master file may be combined with the RK master file, so that a single master sub-file is provided with each account and all of the transactions are stored with each master sub-file (or a separate transaction file may be provided). It is not necessary for the DDA

master file to carry RK flags that identify the RK accounts; the checks and deposit slips may be pre-printed with a machine-readable field (e. g. by specially assigned Acctnos) to identify the account as such. That field is carried in the TRAFRS and the daily RK TRAFI 82 (Fig. 2) may be constructed via a test similar to test 80 which identifies the TRAFRS for RK processing. Similarly, credit-card accounts may be appropriately identified for RK processing. The system is not limited to using the MAFI Change Run for correcting the RK MAFI records where, for example, a Catno had been omitted from a transaction and therefore was not reflected in the accumulated YTD totals. The correction may be made in the Jrnl Run by generating a TRAFR with the Catno and appropriate data so that the YTD record can be properly updated by control 436 (Fig. 8C). Such a TRAFR is supplied with an appropriate flag so that control 436 is limited to accumulation in register 400 but not in register 402 or 408; thereby, the Acct-tot is not changed since it had previously accumulated all transactions, with or without valid Catnos. Such modified systems will be readily apparent to those skilled in the art from the foregoing description.

As described above, this invention provides control mechanisms for a stored-program digital computer, whereby the record-keeping of financial transactions of different types of persons and businesses can be automatically performed. This invention is adaptable for use with various types of computers including those with large or small memory capacities and those with different types of storage files and input-output devices. In addition, the principles of this invention are applicable for use with a special purpose computer having all of the control mechanisms of the various runs and the files built into the computer in the form of equivalent logic design. For example, various ones of the above-described runs may be built into the control system 14 by suitable logic circuits. The RK MAFI may take various known forms and it functions as a logic board or control program in that each master sub-file specifies the control operations to be performed in accordance

with the sub-file's particular chart of accounts. However, the stored-program form of the invention described above is preferred in that it is comparatively much less expensive and more compact. In addition, the stored-program enables one to modify, enlarge or simplfiy the system by modification of one or more portions of the runs; such modification is readily performed without rewiring of the machine circuitry. Similarly, each customer's chart of accounts may be readily modified to meet the customer's changing record-keeping requirements simply by inserting or deleting the various records making up his master sub-file. The RK MAFI may be constructed to have a greater or lesser amount of variability among the accounts. For example, instead of the totalizing records 155 and 157 that are inserted in and made part of the master sub-file, pre-assigned Catnos (such as 100, 200, 300, etc.) may be used solely to initiate the totalizing operations in the Summary Run; and each time a master sub-file is processed, tests similar to tests 568 and 570 (Fig. 9B) would determine when any of the pre-assigned Catnos fall between those in the registers 184 and 186 and call in the associated totalizing operations. In constructing each chart of accounts, with such pre-assigned totalizing Catnos, the category areas are similarly predetermined by the total Catnos. Various other modifications of this invention will be apparent to those skilled in the art from the above descriptions of illustrative forms of this invention. The appended claims are intended to cover such modifications as are encompassed by the scope and spirit of this invention.

Appended hereto is a print-out of a complete program of one form of this invention for use in the IBM 1400-series computers. The print-out is written in the Autocode assembly language, and the program when assembled into the machine language for said IBM computer, controls and directs the operation of that computer in accordance with the invention and particularly with the form thereof illustrated in Figs. 6-9. Also appended hereto is a detailed flow chart of said complete program.

[APPLICATION DRAWINGS]

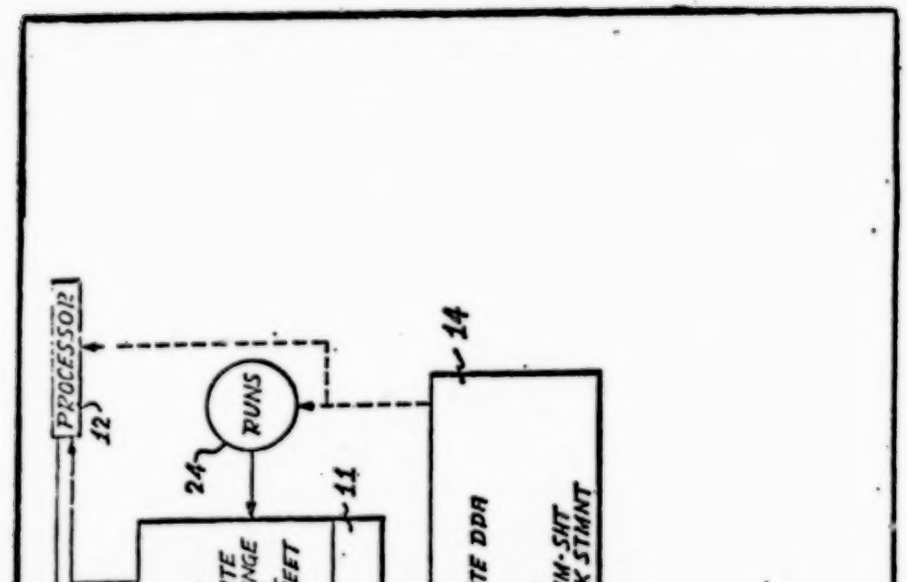

Fig. 1.A.

INVENTOR
THOMAS R. JOHNSTON
BY Morton C. Jacobs

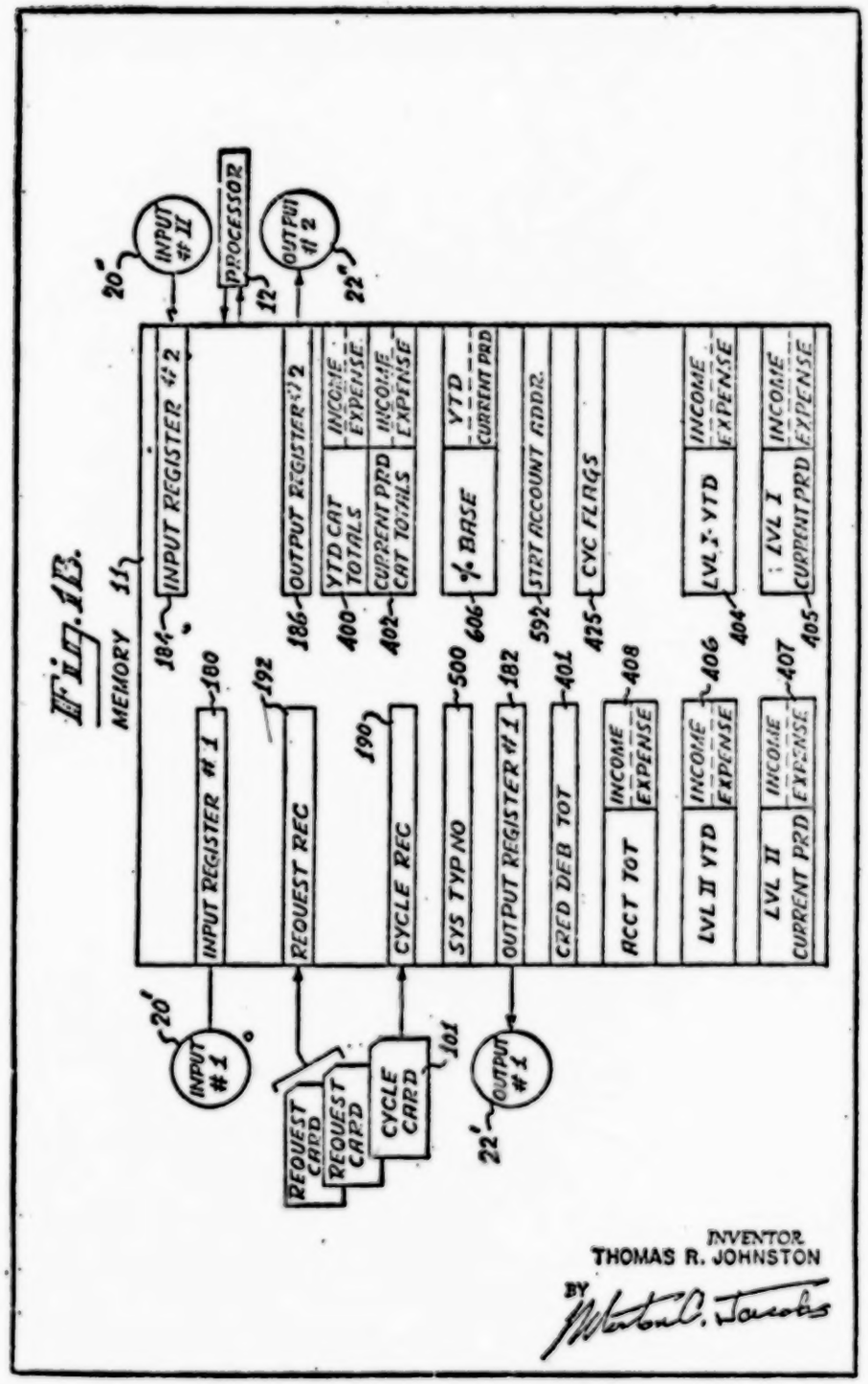

Fig. 1.B.

INVENTOR
THOMAS R. JOHNSTON
BY Morton C. Jacobs

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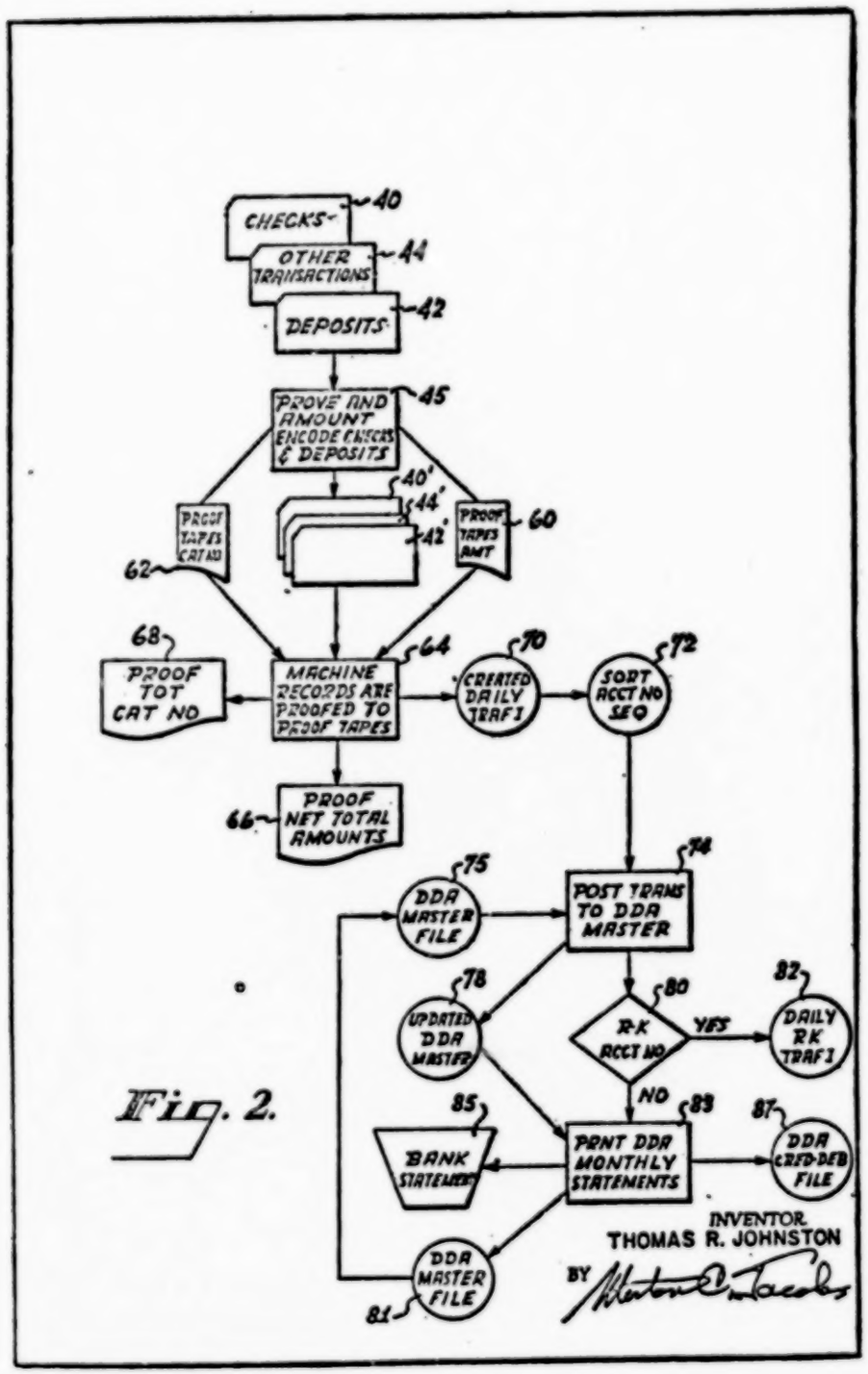


Fig. 2.

INVENTOR.
THOMAS R. JOHNSTON
BY Morton C. Jacobs

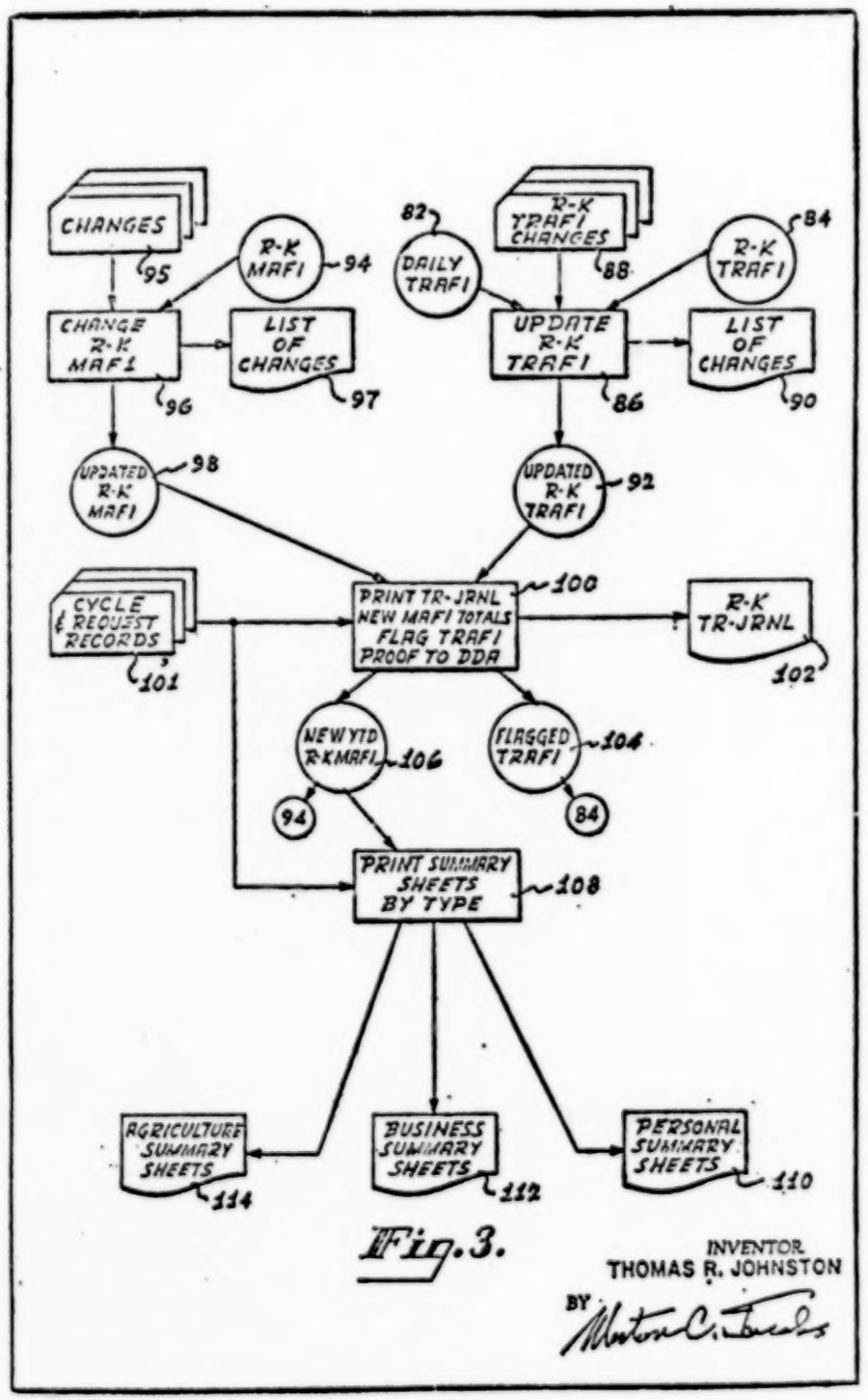
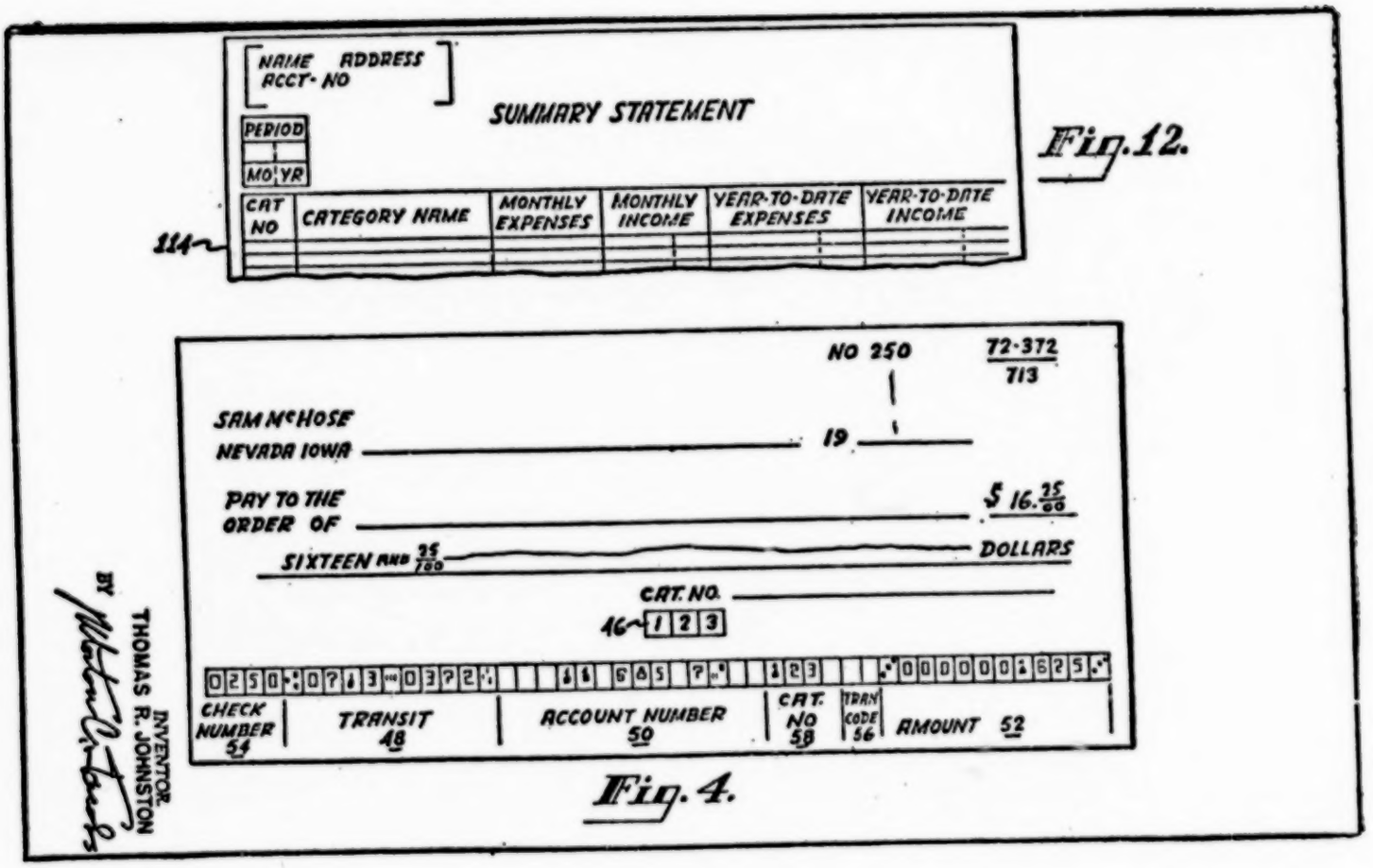
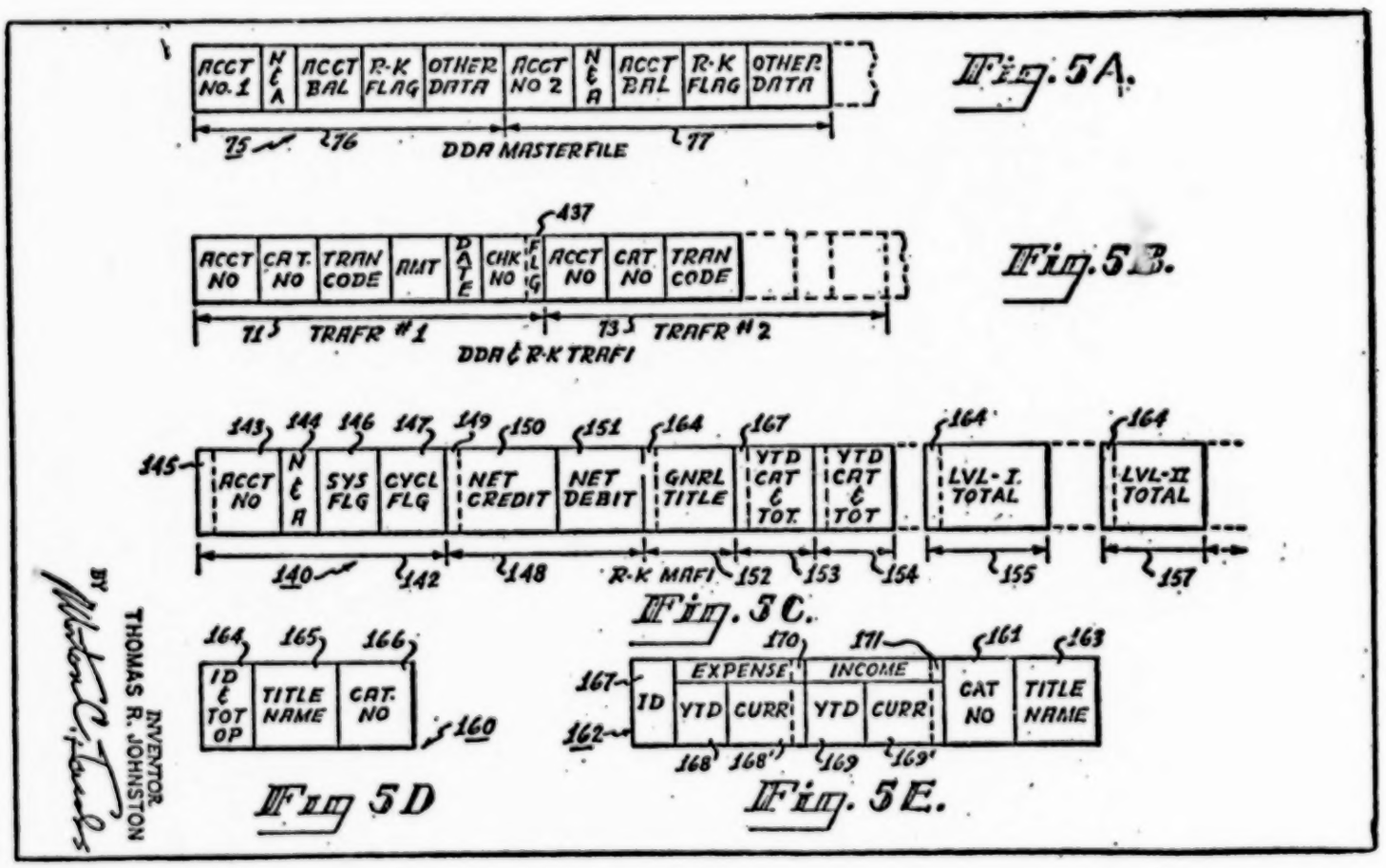


Fig. 3.

INVENTOR.
THOMAS R. JOHNSTON
BY Morton C. Jacobs


NAME ADDRESS ACCT-NO
SUMMARY STATEMENT
PERIOD
MO YR
CAT NO
CATEGORY NAME
MONTHLY EXPENSES
MONTHLY INCOME
YEAR-TO-DATE EXPENSES
YEAR-TO-DATE INCOME
114
Fig. 12.
NO 250
72-372
713
SAM McHOSE
NEVADA IOWA
19
PAY TO THE ORDER OF
$ 16.25/00
SIXTEEN AND 25/100
DOLLARS
CAT. NO.
46
1 2 3
CHECK NUMBER 54
TRANSIT 48
ACCOUNT NUMBER 50
CAT. NO 58
TRAN CODE 56
AMOUNT 52
Fig. 4.
INVENTOR. THOMAS R. JOHNSTON
BY


ACCT NO. 1
N & A
ACCT BAL
R-K FLAG
OTHER DATA
ACCT NO 2
DDA MASTERFILE
75
76
77
Fig. 5A.
437
ACCT NO
CAT. NO
TRAN CODE
AMT
DATE
CHK NO
FLG
TRAFR #1
TRAFR #2
DDA & R-K TRAFI
71
73
Fig. 5B.
143
144
146
147
149
150
151
164
167
145
SYS FLG
CYCL FLG
NET CREDIT
NET DEBIT
GNRL TITLE
YTD CAT & TOT
LVL-I TOTAL
LVL-II TOTAL
140
142
148
R-K MAFI
152
153
154
155
157
Fig. 5C.
ID & TOT OP
TITLE NAME
CAT. NO
160
Fig 5D
170
171
161
163
167
EXPENSE
INCOME
YTD
CURR
CAT NO
TITLE NAME
162
168
169
Fig. 5E.
INVENTOR. THOMAS R. JOHNSTON
BY

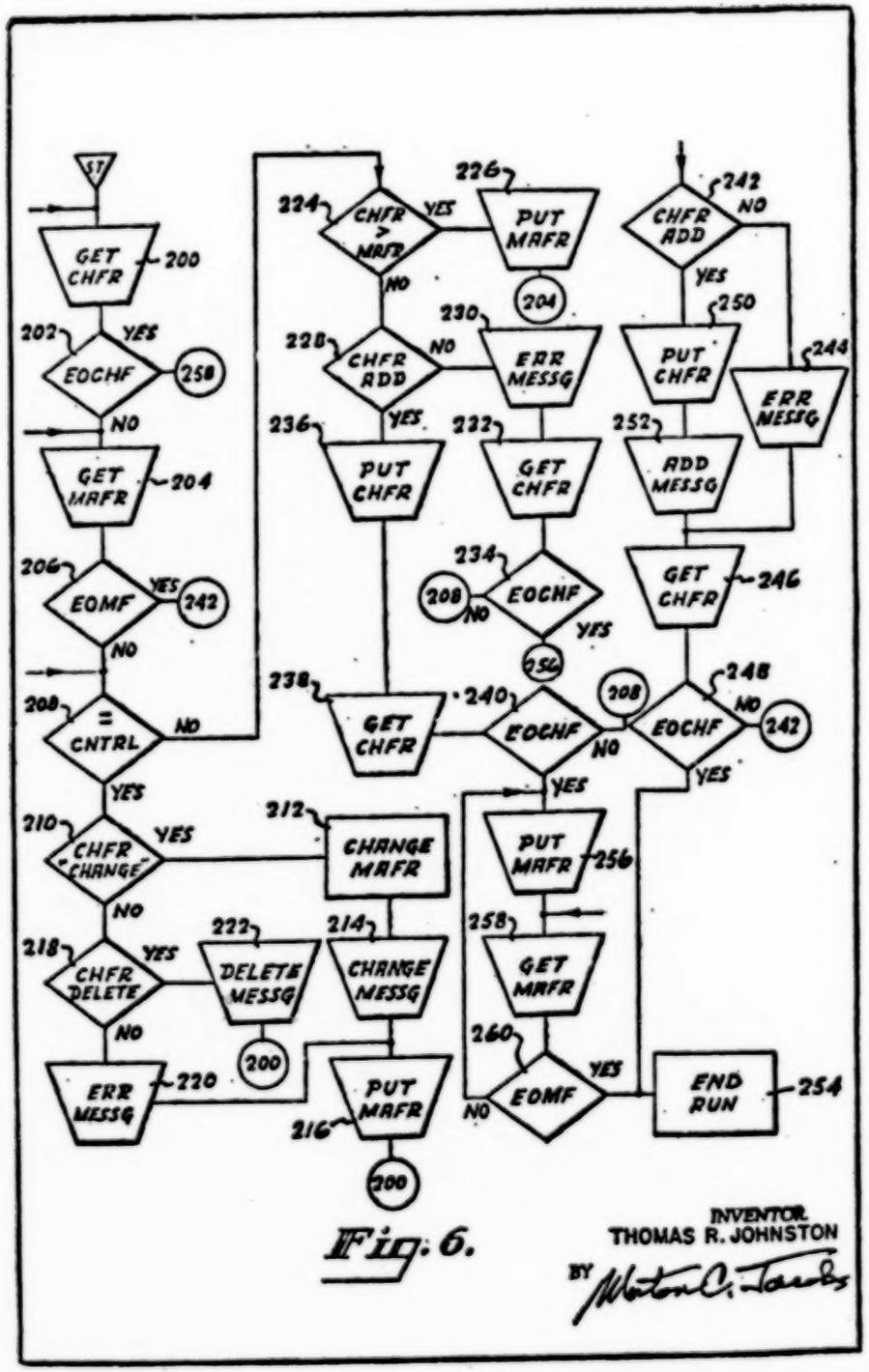


Fig. 6.

INVENTOR
THOMAS R. JOHNSTON
BY Morton C. Jacobs

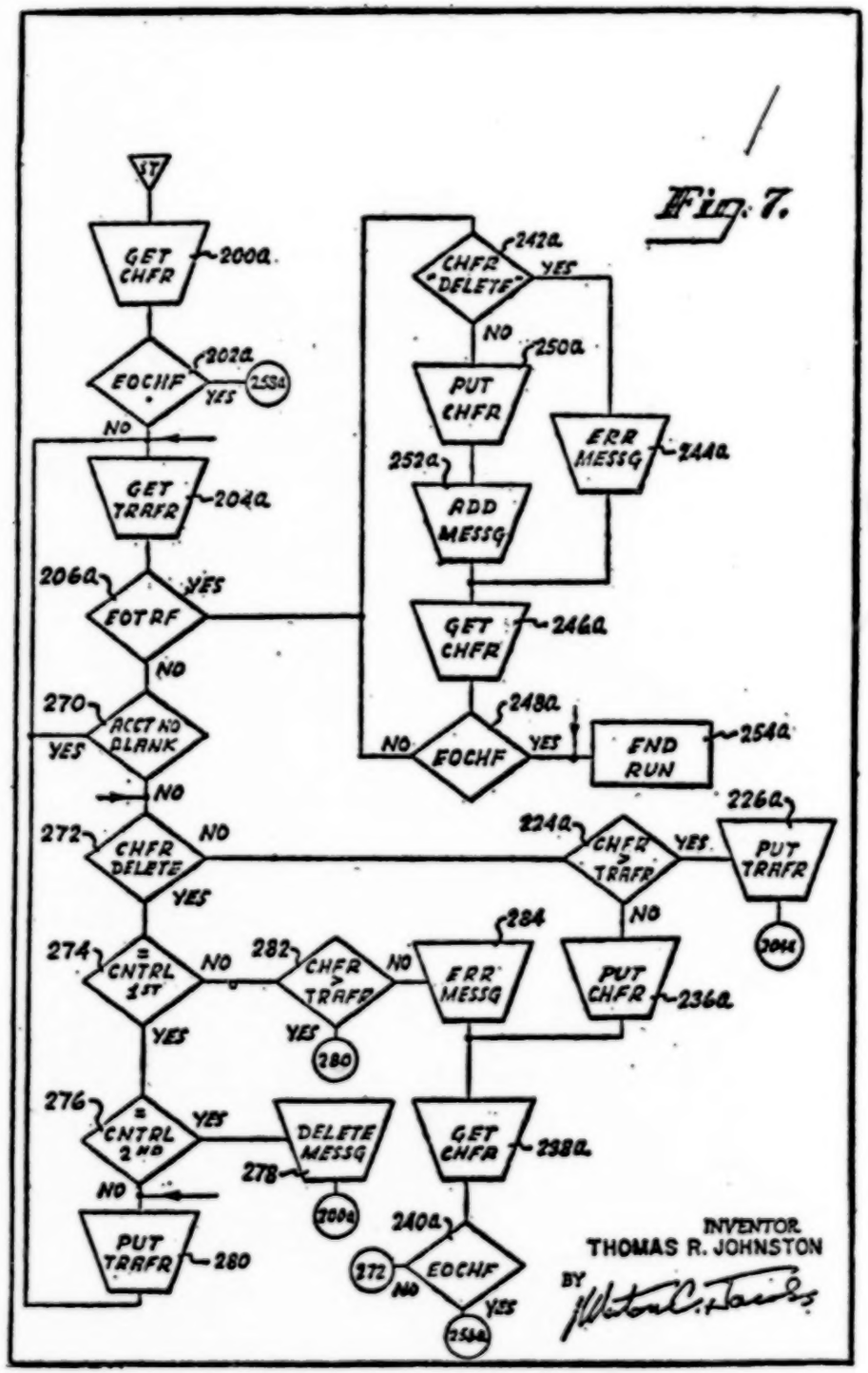


Fig. 7.

INVENTOR
THOMAS R. JOHNSTON
BY Morton C. Jacobs

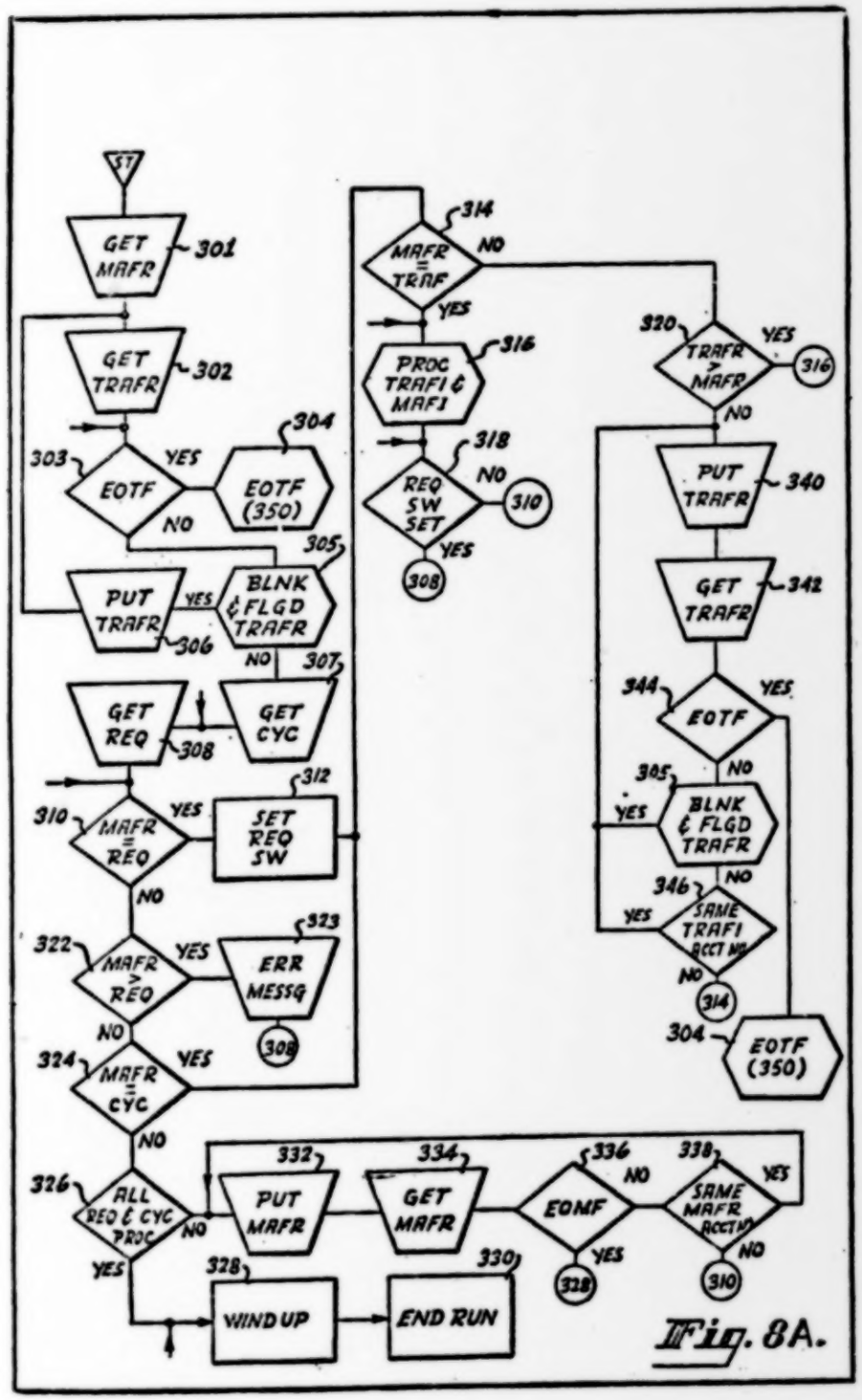

ST
GET MAFR
301
GET TRAFR
302
EOTF
303
YES
NO
EOTF (350)
304
PUT TRAFR
306
YES
BLNK & FLGD TRAFR
305
NO
307
GET REQ
308
GET CYC
MAFR = REQ
310
YES
SET REQ SW
312
NO
MAFR > REQ
322
YES
ERR MESSG
323
308
NO
MAFR = CYC
324
YES
NO
ALL REQ & CYC PROC
326
NO
YES
PUT MAFR
332
GET MAFR
334
EOMF
336
NO
YES
328
SAME MAFR ACCT NO
338
YES
NO
310
WIND UP
328
END RUN
330
MAFR = TRAF
314
NO
YES
PROC TRAFI & MAFI
316
REQ SW SET
318
NO
YES
308
TRAFR > MAFR
320
YES
316
NO
PUT TRAFR
340
GET TRAFR
342
EOTF
344
YES
NO
BLNK & FLGD TRAFR
305
YES
NO
SAME TRAFI ACCT NO
346
YES
NO
314
EOTF (350)
304

Fig. 8A.

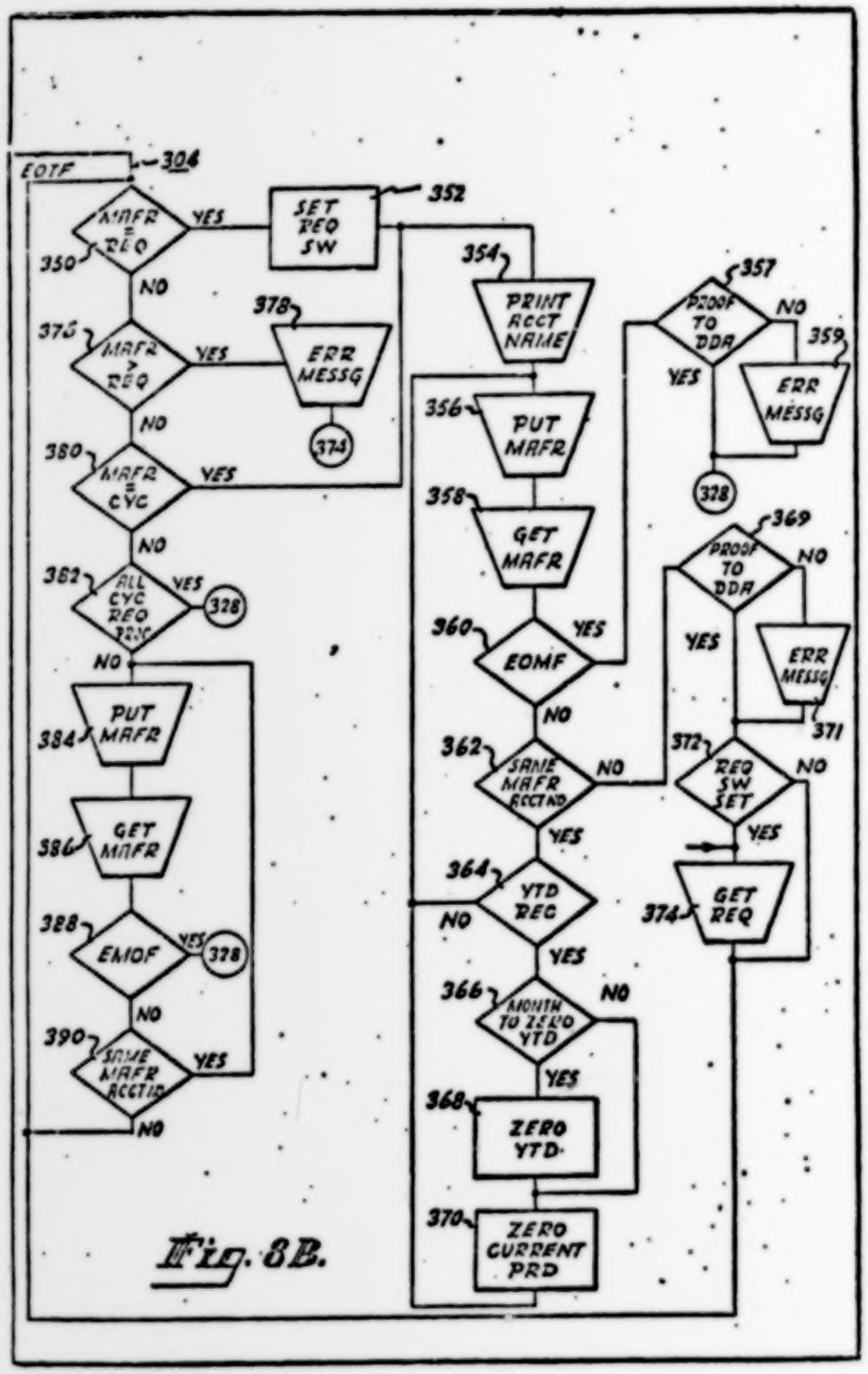

EOTF
304
MAFR = REQ
350
YES
SET REQ SW
352
NO
MAFR > REQ
376
YES
ERR MESSG
378
374
NO
MAFR = CYC
380
YES
NO
ALL CYC REQ PROC
382
YES
328
NO
PUT MAFR
384
GET MAFR
386
EMOF
388
YES
328
NO
SAME MAFR ACCT NO
390
YES
NO
PRINT ACCT NAME
354
PUT MAFR
356
GET MAFR
358
EOMF
360
YES
NO
SAME MAFR ACCT NO
362
NO
YES
YTD REC
364
NO
YES
MONTH TO ZERO YTD
366
NO
YES
ZERO YTD
368
ZERO CURRENT PRD
370
PROOF TO DDA
357
NO
YES
ERR MESSG
359
328
PROOF TO DDA
369
NO
YES
ERR MESSG
371
REQ SW SET
372
NO
YES
GET REQ
374

Fig. 8B.

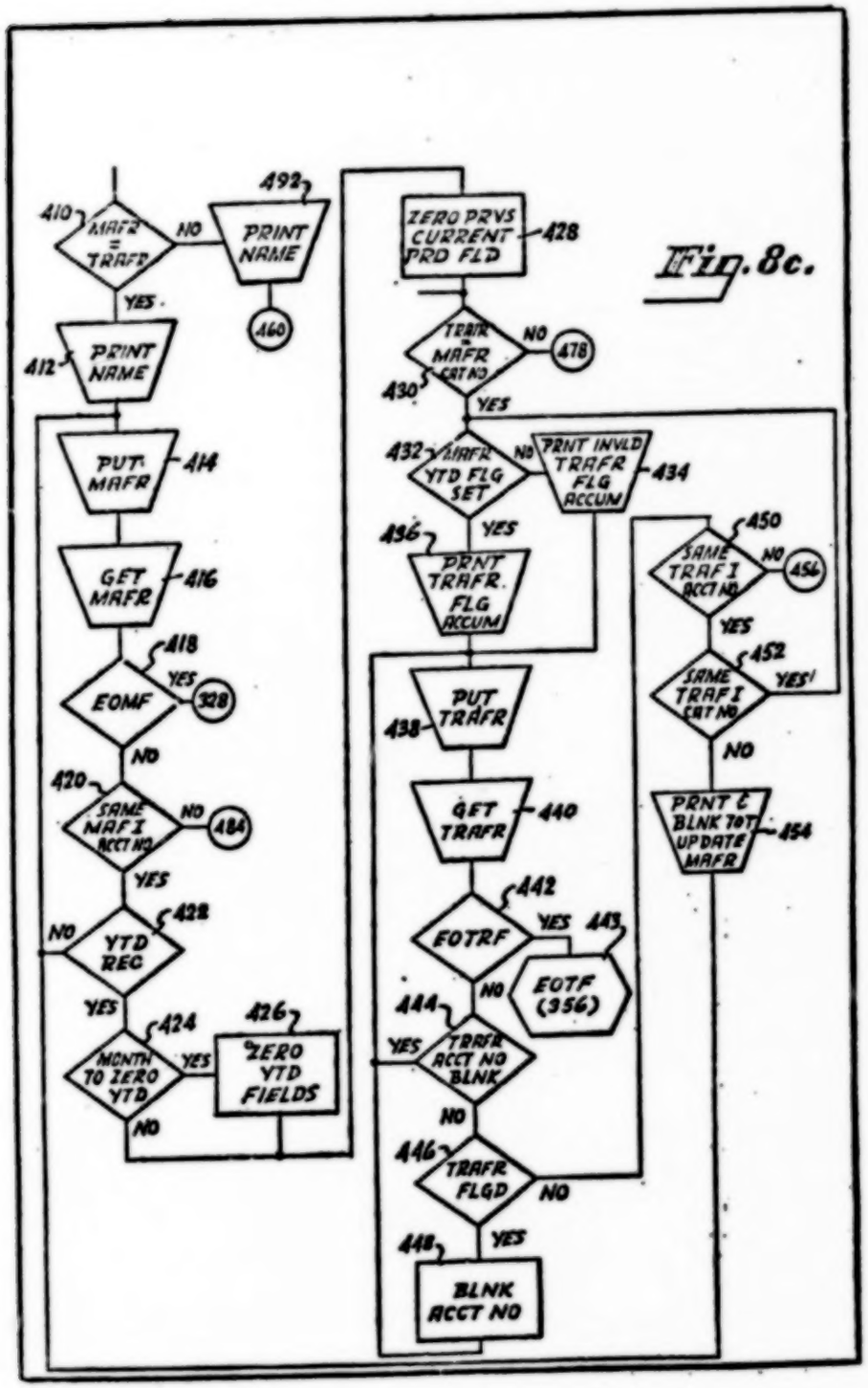


Fig. 8C.

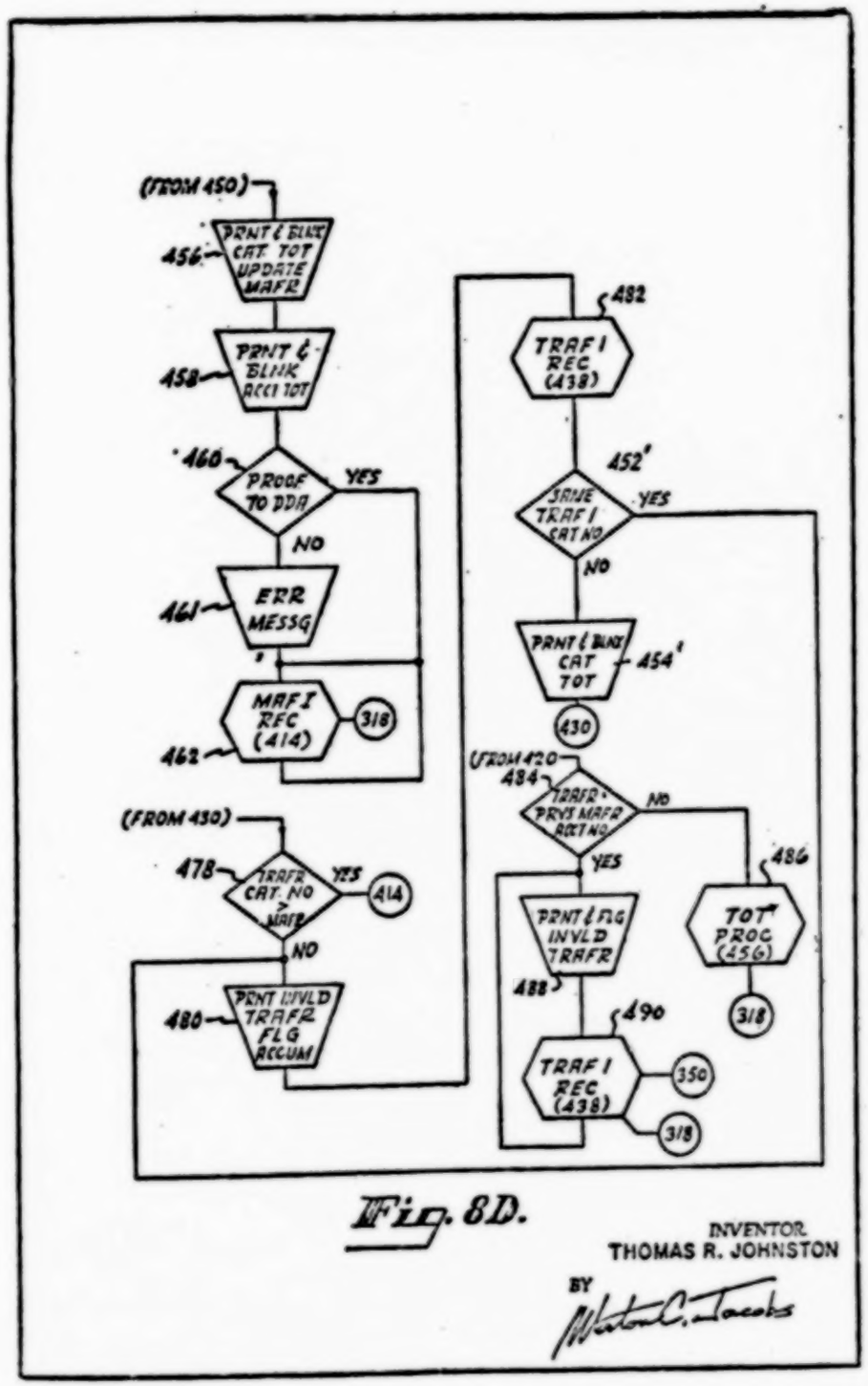


Fig. 8D.

INVENTOR
THOMAS R. JOHNSTON
BY
Watson C. Jacobs

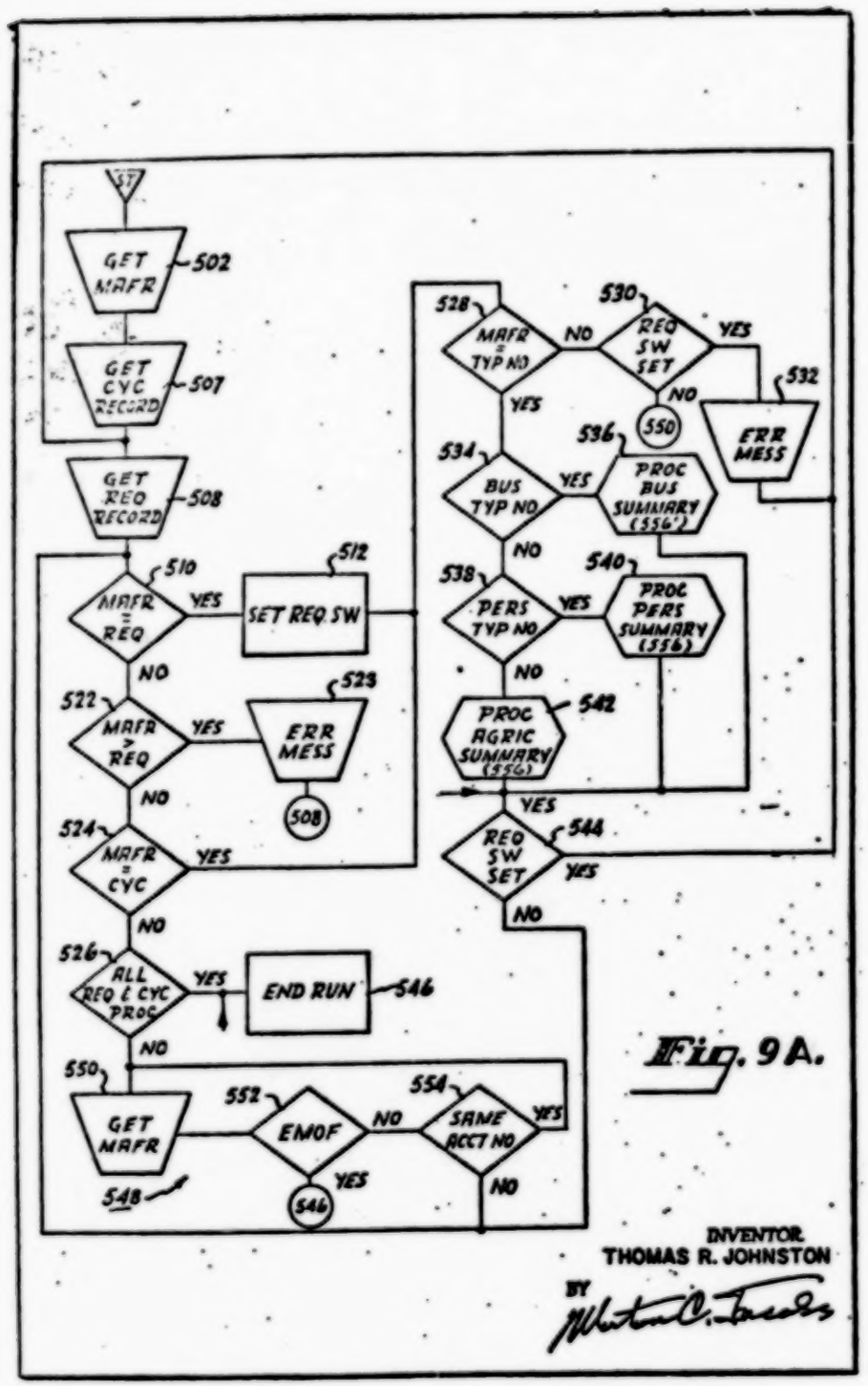


Fig. 9A.

INVENTOR
THOMAS R. JOHNSTON
BY

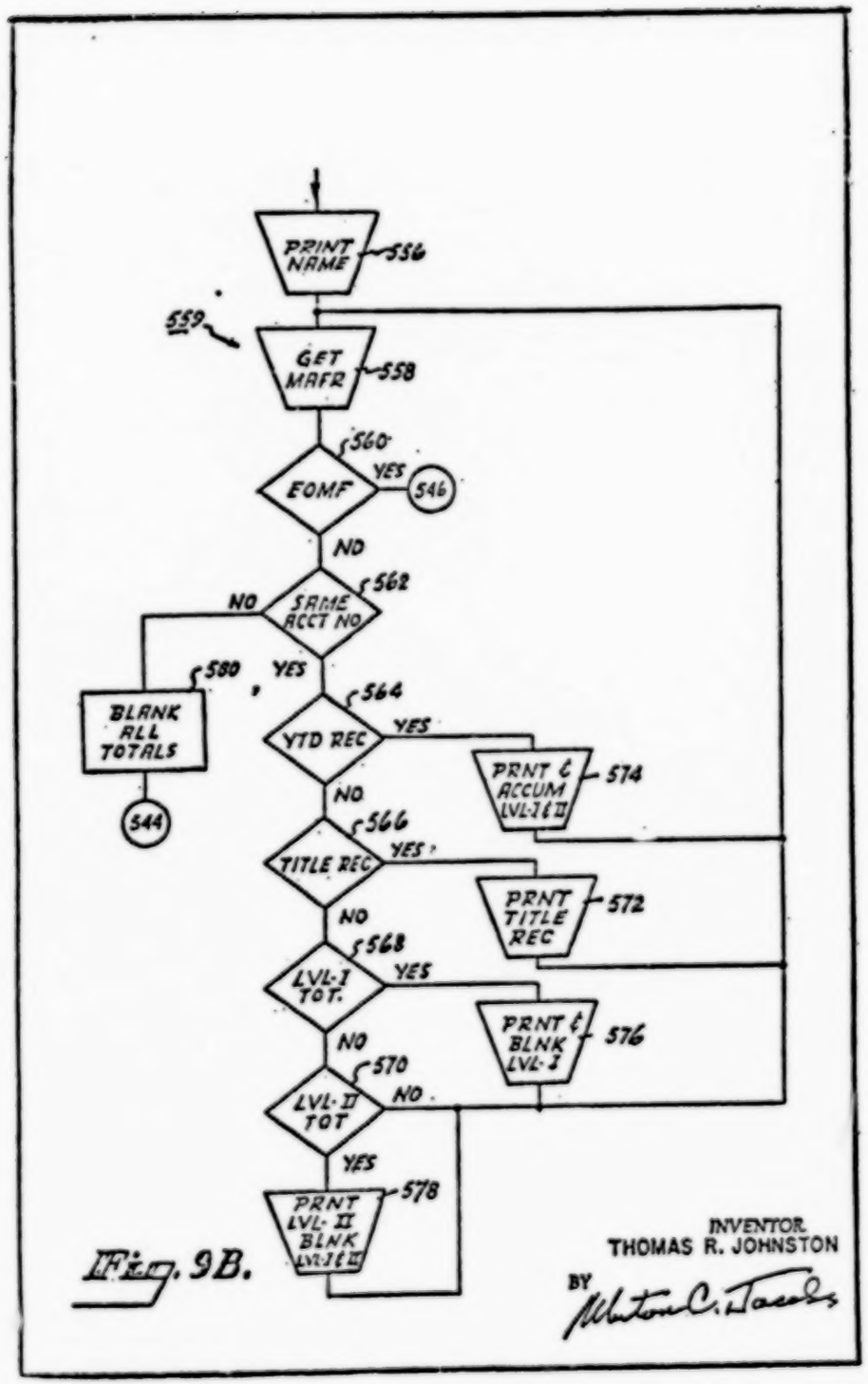


Fig. 9B.

INVENTOR
THOMAS R. JOHNSTON
BY

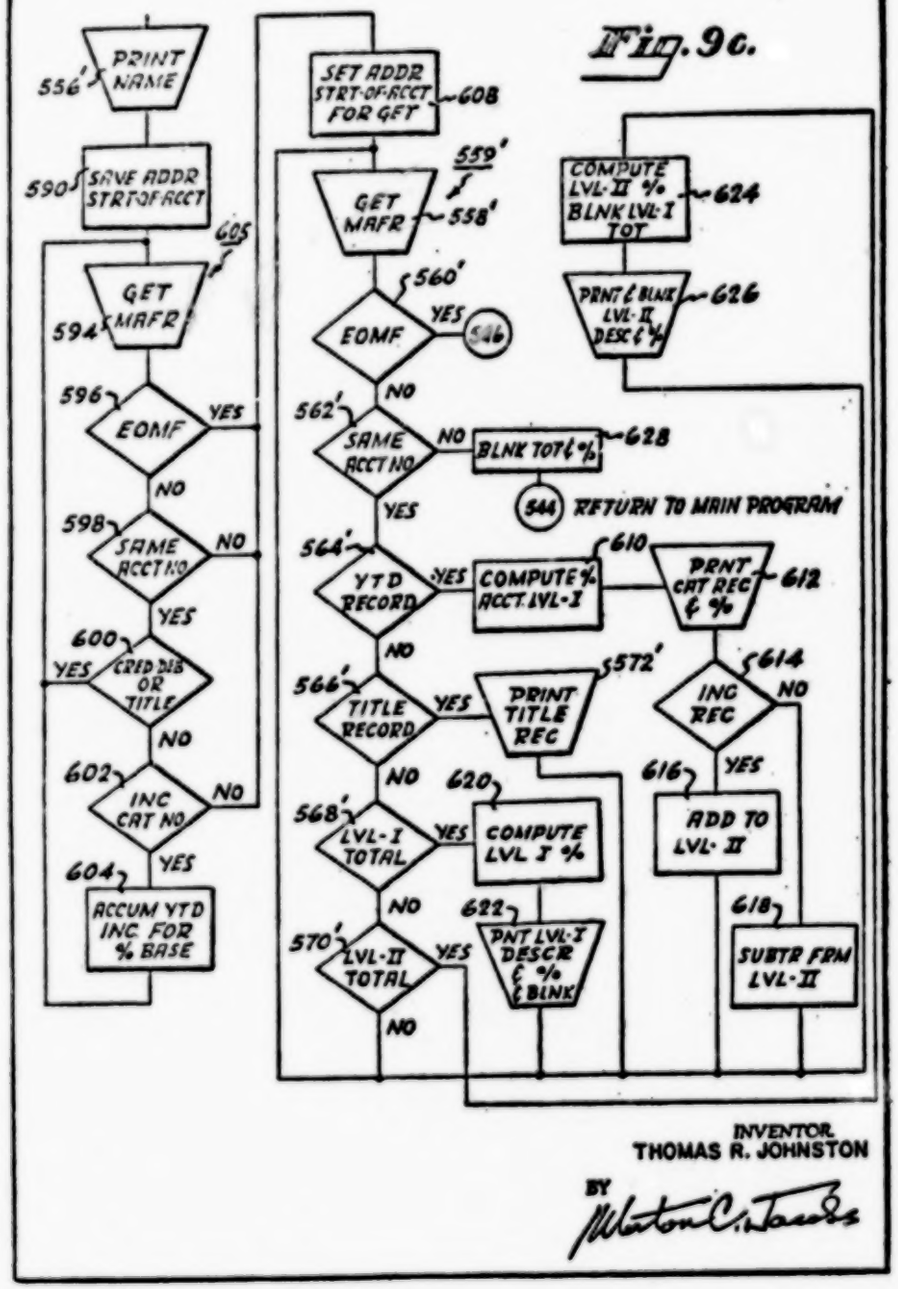


Fig. 9c.

INVENTOR
THOMAS R. JOHNSTON

BY Morton C. Jacobs

TRANSACTION JOURNAL

PERIOD 04 67 (MO YR) | ACCOUNT NO 21 2-12 3 | NAME ADDRESS

CAT NO	CHECK NO	DATE	ACCOUNTS CHECKS	ACCOUNTS DEPOSITS	COMMENTS
	0104	03 25 66	2 87		NON CODE
			2 87		***
128		03 31 66		51 46	INVALID CODE
				51 46	***
131	0101	03 31 66	6 77		
131	0103	04 04 66	2 00		
			8 77		***
			11 64	51 46	ACCNT TOT.

102

Fig. 10.

NAME ADDRESS, ACCT-NO 120 — SUMMARY STATEMENT

MO YR 122

124 CAT NO.	CATEGORY NAME	126 128 ACCOUNTS CURRENT MO.	130 ACCOUNTS YEAR TO DATE	587 PERCENTAGES CURRENT MO.	584 PERCENTAGES YEAR TO DATE
100	INCOME				
101	DIVIDENDS		8 90		
107	WAGES	511 48	1464 93		
	TOTAL INCOME	511 48	1473 83		
120	EXPENSES				
121	AUTO	40 13	160 95		
125	CLOTHING	5 100	67 41		
	TOTAL EXPENSES	293 12	1240 61		

110

Fig. 11.

INVENTOR
THOMAS R. JOHNSTON

BY Morton C. Jacobs

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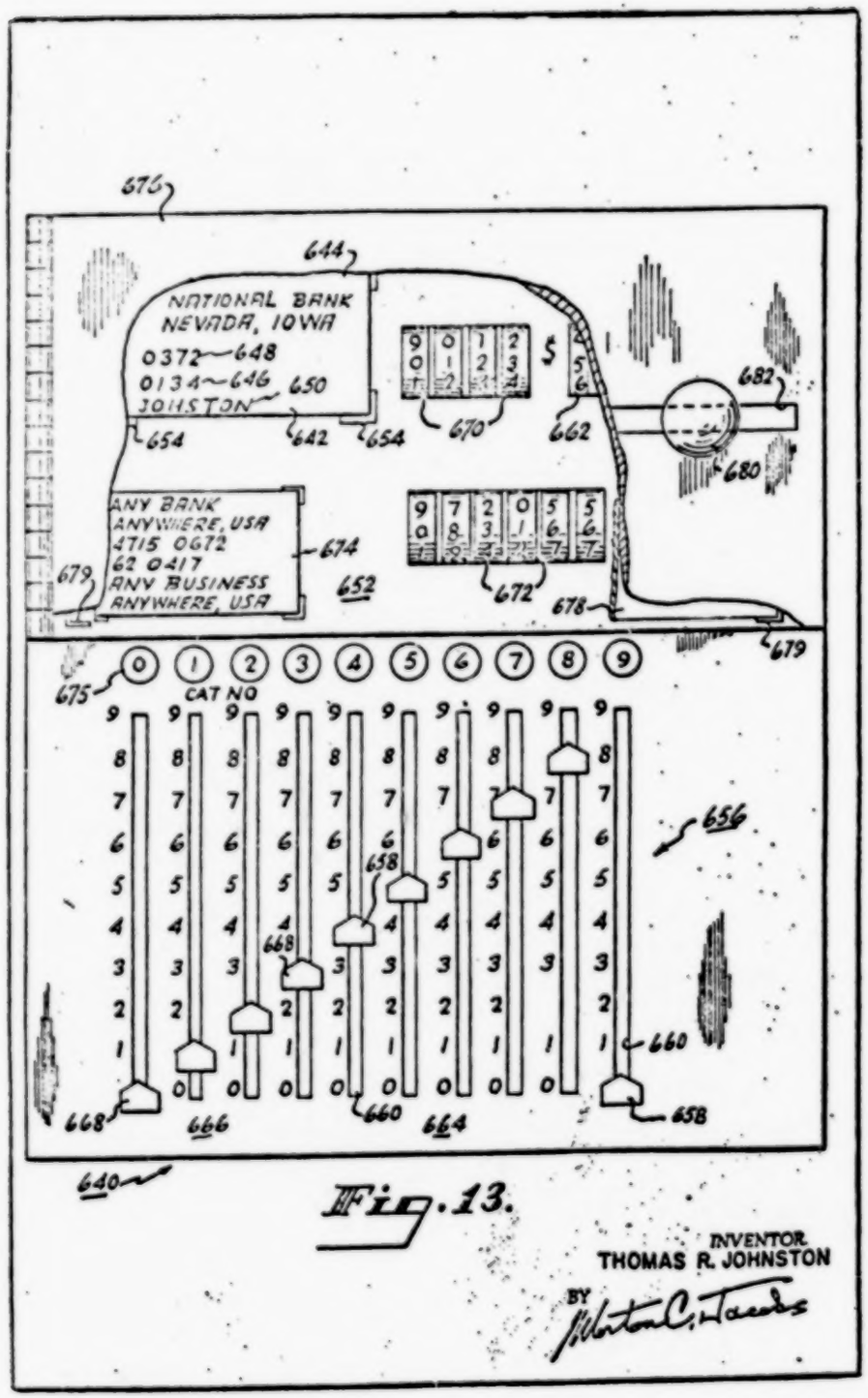

Fig. 13.

INVENTOR
THOMAS R. JOHNSTON
BY Wilton C. Fowler

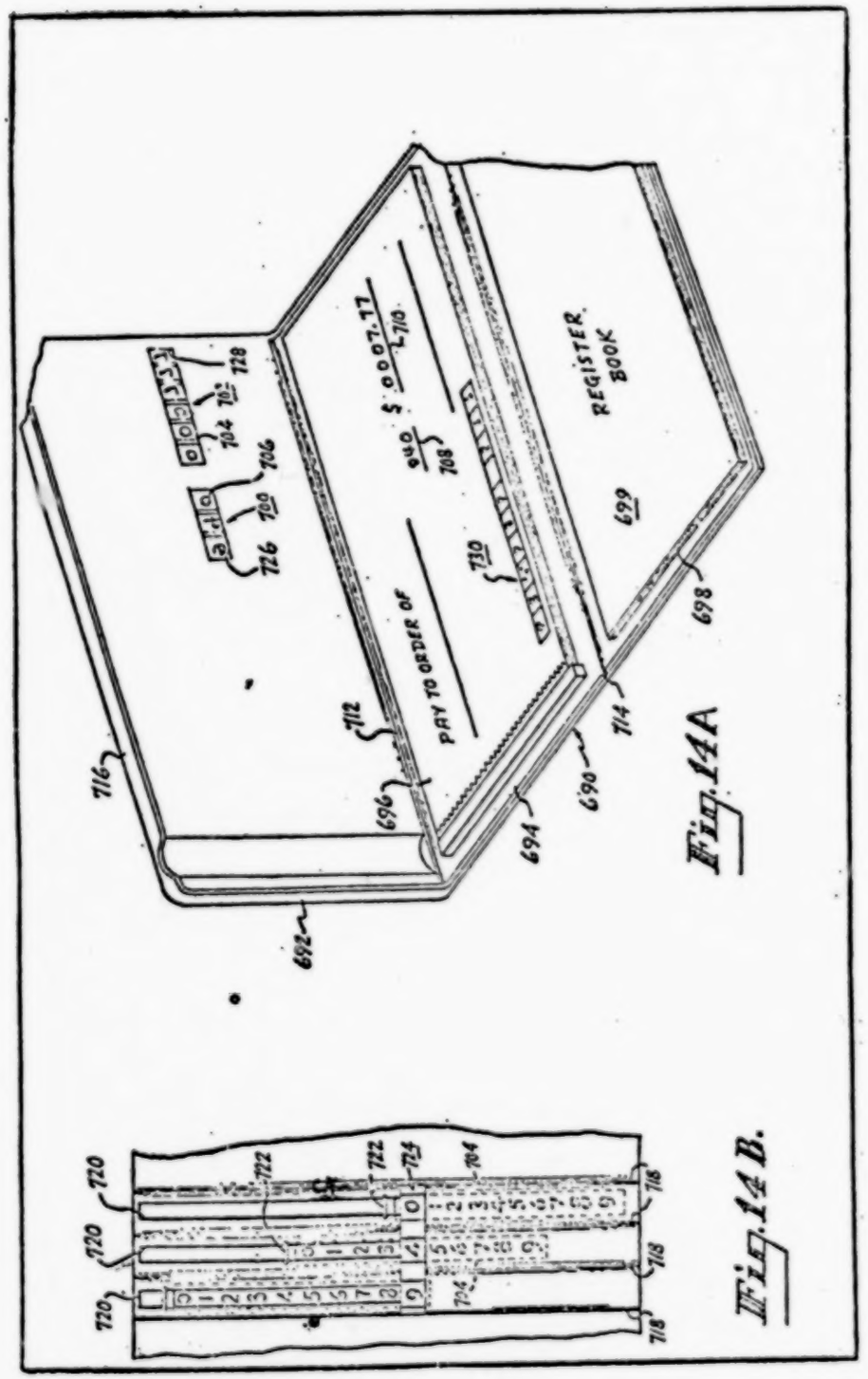

Fig. 14A

Fig. 14B.

EXAMINER'S ANSWER, NOVEMBER 3, 1970.

This is in answer to an appeal from the Final Rejection of Claims 1 through 11 and 16 through 27. Claims 12 through 15 were withdrawn from consideration when applicant acceded, without traverse, to an election requirement. No claim is allowed.

A correct listing of the claims under appeal appears in Pages 3 through 17 of applicant's Appeal Brief.

THE REFERENCES RELIED UPON FOR THE FINAL REJECTION ARE:

3,274,554	Hopper et al	September 20, 1966
3,308,439	Tink et al	May 7, 1967
3,343,133	Dirks	September 19, 1967
3,374,462	Best et al	May 19, 1968
3,407,387	Looschen et al	October 22, 1968

APPELLANT'S INVENTION:

Appellant's invention is a financial record keeping process for monitoring the various dealings of persons using the services of a bank. It is a process that is designed to elicit information from transaction documents, to update the bank's records for such persons, and to then produce monthly bank statements for mailing to such persons.

The process is set forth in the form of a computer program which is to function with an automatic system. Appellant's disclosed best mode is a computer program listing which is to be used with an IBM 1400 series computer. It is noted that appellant's "preferred embodiment" as set forth in lines 11-16 on Page 19 of his Appeal Brief is contradictory in some very important aspects (i.e., elements 10 and 14 on Fig. 1A) to his "preferred embodiment" as set forth in lines 14-22 on page 7 and lines 1-3 on page 92 of his specification.

The various subroutines or phases of appellant's process are set out in Pages 20-40 of his Appeal Brief. It is noted that appellant uses the term "mechanisms" to describe his various program subroutines or phases and concedes that his invention (i.e. process) "is adaptable for use with various types of computers" (see Page 40 of his Appeal Brief).

EXPLANATION OF THE REFERENCES:

The patent to Hopper et al shows a document reader and operating console for input data, magnetic tape transports for master and updated files, memory and processing modules with controls therefore, and a document printer and a magnetic drum as output devices. The various mechanisms of Hopper et al are computer programmed controlled.

The patent to Tink et al shows a banking system having multiple teller stations interconnected with a data processor and a random access unit operating under program control. A bank customer can get full information of his account, updated, at the time he engages in a transaction with a bank teller. Non-personal contact transactions also can be entered in the data processor for recordation and updating of files, however, when it is most convenient to the bank.

The patent to Dirks shows a program controlled data handling system having an input means and input file, a central processing file system, output file and a printer output unit (i.e. Fig. 49 and Columns 3-5) which is used for file maintenance, up-dating for current balances and generating printed output documents.

The patent to Best et al shows an operator as well as program controlled computer, a memory with controls therefore for computational purposes and a printer output unit.

The patent to Looschen et al shows a program controlled banking system similar to Tink et al, and which

has all of the features and abilities of Tink et al. In addition, Looschen et al includes a polling system primarily to establish interconnection between a central control and a particular window machine.

It is noted that appellant admits that all of the cited references are adaptable, when properly programmed, to carry out the methods of his invention (see Page 41 of his Appeal Brief) as is set forth in his computer program.

THE FINAL STATUS OF THE CLAIMS:

Claims 1-8, 10, 11 and 16-24 are rejected under 35 U.S.C. 112 for failing to particularly point out and distinctly claim the subject matter which the appellant considers as his invention, as was stated in Paragraph 13 of the January 6, 1970 Final Action which is incorporated herein. Appellant's claims are considered as misleading and hiding his true contribution in that he is claiming a program as structure using the means-plus-function format.

Claims 1-8, 10, 11 and 16-24 are rejected under 35 U.S.C. 112 as claiming a program in means-plus-function language (in apparatus form) as indicated in Paragraph 15 of the January 6, 1970 office action which is incorporated herein. The claims are considered to be directed to a use for a known machine.

Claims 1-11, and 16-24 are rejected under 35 U.S.C. 102 as being anticipated by Hopper et al, Tink et al, Dirks or Best et al as indicated in Paragraph 16 of the January 6, 1970 Final Action which is incorporated herein. Appellant's "banking system limitation" is not considered controlling.

Claims 25-27 are also rejected under 35 U.S.C. 102 as being anticipated by Tink et al or Looschen et al, as indicated in Paragraph 18 of the Final Action and which is incorporated herein.

RESPONSE TO APPELLANT'S ARGUMENTS:

Since the appellant has chosen to argue the patentability of his claims in several categories, this RESPONSE will follow such format in order to provide continuity between Argument and Response.

1. *The Rejections on Prior Art*

The first claims considered by appellant are Claims 25-27, which are method claims which were submitted by the appellant by supplemental amendment. Such claims stand rejected under 35 U.S.C. 102 as being anticipated by Tink et al or Looschen et al.

The two cited references are considered to comprise all of the computer elements specified in appellant's claims, i.e., a computer master and sub files, account numbers, records for category codes and monthly statement generators.

Appellant places great weight for the patentability of his method claims on his terms "demand deposit banking accounts" and "category code numbers". The theory behind "demand deposit banking" accounting and "savings accounts" accounting is essentially the same. Transactions against specific bank accounts are normally organized by "category codes" (i.e. deposit, withdrawals, charges against or interest earned). Whereas, the appellant uses code numbers for his individual transactions and Tink et al or Looschen et al do not, both procedures end with the same result (i.e. updated bank records and the monthly generation of bank statements).

In essence, the appellant is seeking patent coverage for a process which (1) he has assigned a particular name to and (2) uses numbers. No new steps over the prior art methods are considered to be found in such "numbered particularly named" process. Certainly, what one can do with bank savings accounts he can obviously do with bank demand deposits.

Claims 1-11 and 16-24, as apparatus claims, are treated next. Such claims stand rejected under 35 U.S.C. 102 as being anticipated by Hopper et al, Tink et al, Dirks or Best et al.

Appellant admits (1) that his so-called apparatus system is defining process steps in the means-plus-function format (see page 47 of the Appeal Brief) and (2) that the cited prior art general purpose computers are capable, structure-wise, of carrying out his invention, i.e. a computer program (see Page 41 of the Appeal Brief). In the face of such admissions, it is inconceivable that the appellant can contend that the structure of the cited references does not anticipate what he is claiming. It is again emphasized that appellant has not cited any specific structural elements of his "best mode" (i.e., the programmed IBM 1400 computer) which are correlated to his individually claimed "means". It is noteworthy to indicate that the IBM 1400 computer can assume a variable number of configurations in dependence upon the needs of the particular customers. No structural elements not shown by the cited references are found in appellant's claims.

Appellant's citation of *Prater and Wei*, 162 U.S.P.Q. 541 (1969) as authority for his position is considered without merit. What was said by the court relative to the operation of a programmed general purpose computer was dicta for such operation was not an issue in that case.

As for *Bernhart and Fetter*, 163 U.S.P.Q. 611 (1970) what is discussed therein is not pertinent to the present issue involved herein. The issues involved in such case dealt with statutory subject matter and a method for the use of a planar plotting apparatus. No such issues appear in this Appeal.

Appellant's claimed "system" cannot operate wholly without human intervention because of the need to initially manually fill in the transaction records either by the

bank's customer or the bank teller, the need to insert the records into a reader and the need to generate individual output reports on a monthly basis.

Appellant's machine readable records are only a small part of the invention he seeks patent coverage for. *In re Jones*, 153 U.S.P.Q. 77. was cited by appellant in support of his machine readable records, but such case was directed to a disc (structure) with etched markings on it that activated a photocell, and is therefore considered not pertinent. Appellant's whole invention is a program, written in the form of symbols, and it is intended that such program convey intelligence to any one reading it.

2. *Rejections Under 35 U.S.C. 112*

Appellant's own admissions that his total invention is a process, in the form of a program, that directs a general purpose computer system through a series of steps should negate any contention that he should be entitled to structure claims (i.e. Claims 1-8, 10, 11 and 16-24). Also, Appellant's late submission of process claims 25-27 by Supplemental Amendment is taken as another indication that the proper format for his claims would appear to be the method type claim, as a possible new use for a known machine.

Ex Parte Lewis, 154 U.S.P.Q. 487, which was cited by the appellant, was directed to method claims drawn to the function of an apparatus. Such decision did not uphold "the patentability of machine process claims for computer inventions embodiable in the form of software computer programs" as appellant would have us believe on Page 54 of his Appeal Brief.

The Appellant's argument with regard to Claim 9 is considered untenable for the imprinting "input device" claimed therein can reasonably be considered as structure.

In *Bernhart and Fetter*, the question of the sufficiency of disclosure of that application under 35 U.S.C. 112 was not before the court as it is here. Also, in such

case, no holding such as "a software computer program for—is a physical control device and is properly expressed in apparatus form in means-plus-function language" (see Page 57 of Appellant's Appeal Brief) appears therein, as appellant argues. In the representative structural claims in *Bernhart and Fetter* (i.e. Claims 18 and 19) words such as "electronic signal data processing means—programmed" and "electronic digital computer means programmed" are far different than claiming a software computer program in means-plus-function language.

Concerning the appellant's failure to particularly point out and distinctly claim the subject matter which appellant considers as his invention, his failure to indicate in his disclosure what structural parts of the IBM 1400 system he considers for his individually claimed means is considered sufficient to sustain the rejection of Claims 1-8, 10, 11 and 16-24 under 35 U.S.C. 112.

The blocks in Figs. 6, 7, 8 and 9, referred to on Page 57 of the Appeal Brief, are flow charts setting forth particular routines of appellant's program.

The technical and manufacturing problems raised by this Examiner as being associated with the building of a computer, and dismissed so lightly by the appellant as "within the skill of the art to handle", are very real and highly important to the producers of such structural computers. Many computer configurations, designed "on paper", prove unfeasible or inoperative when reduced to structure.

Should one carry the supposed meaning of *Bernhart and Fetter* decision to a natural conclusion, the number of "physically different" machines appears determined by (1) the length of the program being used on a particular computer multiplied by (2) the number of steps required for each instruction in completing the processing required by that program. The enormity of determining what structure the computer may consist of at a particular thousandth of a millionth of a second (their present operating speed) should be obvious from such conclusion.

SUMMARY:

In view of the above rebuttal of appellant's arguments, when considered with the incorporated Final Rejection, it is submitted that (1) Claims 1-8, 10, 11 and 16-24 do not particularly point out and distinctly claim the subject matter which the applicant considers as his invention nor are such claims in the proper type of claim format as required by 35 U.S.C. 112 (2) Claims 1-8, 10, 11, and 16-27 are anticipated under 35 U.S.C. 102 by prior art. Accordingly, it is submitted that the rejections of the aforementioned claims be upheld and the appellant be denied patentability for any of the submitted claims.

/s/ Paul J. Henon
PAUL J. HENON
Group AHT Unit 237

Conf: P. J. Henon
G. D. Shaw

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DATA HANDLING SYSTEM

Gerhard Dirks, 12120 Edgecliff Place,
Los Altos Hills, Calif. 94022

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The present invention relates to a data handling system. More particularly, the present invention relates to a completely dynamic electronic data handling system.

(1) OBJECTIVES, APPLICATIONS AND OBJECTS OF THE INVENTION

A. General

It is the principal objective of the present invention to provide high performance means at low cost for keeping up-dated and for processing selectively data stored in large capacity memories. In order to have a reasonably small access time to such data, such large capacity memories may be preferably rotating disc file memories. Special applications for such operations are all planning, control and decision making functions in which the effective execution of these functions has to be based on daily, hourly, or other short term up-dated data of great volume, from which only selected fractions of sequences of such data are required in a given situation. Therefore such data must be rapidly retrieved and used in speedy, repetitive rearranging and other processing operations with the possibility of immediate human intervention to achieve effective decisions based upon evaluated facts and such decisions may have again rearranging and processing influences on other data to be determined in first operations and selected in a similar data retrieval manner and rearranged data may be inserted into the old or other data within their new sequence condition. But the combination of sequential data recording with random access to sequences of such data is also extremely useful for simple up-dating of such sequential type of data in short cycles such as, for example, hourly or daily transaction, of which the print-out of detail data with newest sums and balance forwards may be accomplished with economy only in longer time intervals, such as weeks, several weeks, or months, and in which in exceptional cases an instantaneous access to sequences of records collated together under one reference (account) number with read or print-out of these information units is required, such as in ledger type bookkeeping or cost accounting.

The systems applications used until now for such purposes can be classified into three categories. The first category of systems applications is the "tape file-core memory" approach in which information units of data are stored in sequence according to their coordinated key field words, for example, in their ascending order sequence, and in which constructive information units stored in sequence on such tapes may be transferred in one continuous movement into the inner core memory of the computer. Reels of such tape files are exchangable and tape drives permit stepwise moving of the tape for sensing or recording.

The second category of systems applications is the "random access file" approach, in which information units of data are stored in a random sequence according to their coordinated key field words preferably in a disc file, and in which, basically speaking, during one rotation of such file, one single random-wise addressed information unit is transferred to the inner memory, for example, the core memory of the computer.

The third category of systems applications is the "tape file" plus separate, additional "random access file" approach, in which in addition to the solution of the first category, a random access file is provided to keep in each "master file" data.

The solution of the problem described as the first category has the advantage that similarly to a punched card system all the detail and summary data related to each other are recorded adjacent to each other by preceding sorting and merging operations and it permits the handling of large file volumes by the exchangeability of sorted tape files. It has a disadvantage due to the effect of such operation being highly dependent on the fraction ratio between the information unit data of such tape files used for the processed transactions and the total volume of data stored in such files, since a low matching ratio results in long idle passes of the tape over unused information units. While the processing of historical data in long, for example, monthly, intervals provides in general reasonable matching ratios so that tape processing is economical, a good deal of the speed of the computer ability is wasted by the idle pass conditions at the input, if control, management and other decision making functions, in planning daily or hourly or similar short updating, combined with rapid retrieval cycles out of larger volumes of data, are required. This is especially the case if computers are to be used for operations which require volumes of data, but which permit, for example, only short reaction times.

The random file approach of the second category eliminates these difficulties by the known random-wise information unit operation, in which during one rotation of a disc file, single information units may be selected. This process is considerably advantageous under the indicated short-term up-dating and retrieval requirements for single information units.

The solution of the third category is generally in all those cases of advantage where either inquiries are to be obtained in short time retrieval periods, and in which such inquiries are based upon preceding tape type operations, or where file data are to be used repetitively for various purposes in data processing but are to be kept available in up-dated form only once for the purpose of convenience.

The combination of solutions does not eliminate the disadvantage of the tape file system of the first category if sequences of information have to be selected rapidly and are to be rearranged, merged and processed similarly to a tape system operation, but under selective retrieval conditions. For such operations it is therefore essential for an effective use of a computer to use a technical system approach, which combines directly, in an integrated manner, the advantages of sequential operations of tapes with the random access to sequences of such information data in files.

Therefore, the system of the present invention combines the advantages of tape functions and disc file functions in an integrated form by performing directly within the file system sorting and merging functions with information units and arithmetic functions for selected fields of such information units stored within the disc file system. Consequently, in the system of the present invention, the files have not only the character of master and of reference files, but also of transaction and processing files. Similar to other data handling systems, the transactions data themselves may include only a minimum of required data during the first processing steps and may be supplemented by alphabetic and other data from a reference file during following processing steps of operation.

Reference data is recorded on a reference file (A1 of FIG. 1) as hereinafter described and transaction data such as planning, control and report data is recorded on an operative file (B1 of FIG. 1) as hereinafter described

and these data are recorded in the first category solution on tapes. The solution of the second category refers primarily to reference data since it is limited by the non-availability of sorting and merging functions within existing file systems. Systems in the third category preferably include the reference file (A1 of FIG. 1) data in random access files and the operative file (B1 of FIG. 1) data, which require sorting and merging, in tape files. The proposed systems integrates all the data into random accessible files by providing sorting and rearranging of data within the file so that the random access is available to sorted sequences of data for operative file systems similar in sequential operation to tapes but with random access.

Since one of the economy factors of tape usage is the increase of file volumes resulting from the exchanging of tape reels of sorted information unit data, arranged, for example, in sequential ascending order of their key fields, exchangeable random access files, that is, for example, exchangeable disc files storing sequentially sorted information data, are considered preferably as part of the system.

Since a great deal of computer time is often wasted in operations in which the real potential of the computer is scarcely used such as, for example, most of the file maintenance, up-keeping the newest balances, etc., combined with merging and searching functions, an object of the systems approach of the present invention is to provide inexpensive file-oriented computers with high performance rates, especially for sorting, merging and certain arithmetic functions.

The arrangements of the present invention therefore permit, in addition to their other potentials, a more profitable use of the real power of a big computer by eliminating from the computer operations all the simple, but time consuming, operations for which the computer time is too valuable, such as preparing and follow-up of input or output gears with the buffer operation of buffer files. High performance rates for sorting and merging, together with certain arithmetic operations for file handling operations, are achieved by using, as basic elements, cyclic dynamic file systems with low costs per stored bit, at high bit rates. In the cyclic dynamic file systems, a program controlled sorting, merging and other processing of information unit data is accomplished directly within the file system during the transfer of such data from one file storage location to another.

This permits far more efficient and economical as well as simply programable solutions than the conventional tape-core approach in the cases of the handling of administrative type of data, since the emphasis in this type of application lies, in most cases, more on the access to file data and the transfer of data in rearranging, merging, searching, and transfer functions than on complicated mathematical functions in which a given rather limited volume of data is repetitively used with random requirements of access to digits and words in microseconds.

The streaming mode or continuous data flow approach for this type of operation, which forms the basis for the system of the present invention, is in this case especially advantageous since it is incorporated directly in the file system so that it adds only limited additional costs to the cost of the file system itself; the cost of the file system being imposed anyway due to the need for random-sequential access to currently up-dated and rapidly accessible information units. This is especially so, since the only type of larger mathematical operations required in the administrative type of applications is in the field of matrix operations for linear programming and similar functions. This type of operation is also a special streaming mode type of operation in which series of calculations are performed at matrix members in certain determined sequences with large quantities of file data so that the economical high speed technique of the streaming mode is well applicable to this type of operation.

The modern development of the components makes

this systems approach especially attractive, since the use of dynamic storages in the form of delay lines permits an ever increasing speed improvement with inexpensive means in direct cooperation with dynamic file systems, operative in parallel and multiplex use of data transfer and processing channels functions. The computer potential may be thereby greatly improved for administrative operations.

In this type of application and operation, the performance to cost ratio is further greatly improved by the combination of sequential operation with random access, which eliminates the cost for the waste of idle-run or stand still of a plurality of expensive tape drives, and by synchronously and continuously moving recording areas relative to sensing and recording means, which eliminates the start-stop movement of record carriers to signal heads in the sensing and recording direction.

The elimination of the start-stop movement and the continuous synchronous movement of the file relative to the signal heads eliminates the necessity for first transferring selected data from a first stepwise moved record carrier to a static memory to bring them, for the purpose of processing, together with selected data of a second stepwise moved record carrier, before they may be transferred to another stepwise moved record carrier. The eliminated transfers not only add the cost of an expensive large inner random accessible storage system, but, with the present day's components performance, lose speed if the internal, repetitive use of internally stored data is limited and if the total transfer determines the overall speed.

It thus becomes possible, as hereinafter described, that computers with high performance will become available also for medium size and small business and for individual departments and operations of larger corporations communicating with each other in a network.

The administrative type, file-oriented computers with considerable file capacity may be built in desk size, and they themselves may function as a center of several subterminals, thereby forming powerful satellite systems with their own processing abilities.

A further essential factor in obtaining the same or an even better performance of this type of computer as compared to a computer of the tape-core approach is the availability of an inexpensive file type memory in a size containing all the data required for the processing of a given problem. In desk size or departmental machines, an inner storage of about a one to four time multiple of 16,000 recorded information units, or 2 to 8 million characters, with a number of independent stepwise operable signal head movements, may be provided, operating within the same file system where each such drive in cooperation with the storage surfaces replaces for this size of record volumes the function of an independent tape drive.

The same system, in which a number of stepping mechanisms, at least four, are provided, to permit sorting, merging, arithmetic processing during the transfer of data from one storage location to another, may also be very profitably used in large file systems or in smaller systems, increasing their efficiency and usability in a high degree, since they can perform the tape functions with the additional advantage of random-sequential integrated operations. The recorded information units within a track are then, similarly to tape operations, sorted and merged in a sequential order of their key fields in tracks or within groups of tracks of a disc file system, which form a vertical arrangement of tracks and which have individual signal heads located in one step movement location of signal heads over each group of tracks. The groups of tracks, together with consecutive groups of tracks, may in turn be part of a file storage for key field sequentially arranged information units.

There may be two or more input or output channels operative at the same time within the same set of discs

with independent stepping mechanisms for signal heads having equivalent functions to channels having several functions of input and output tape drives. They are far less expensive than tape drives and provide the additional advantage of random sequential access. This permits the completion of all the sorting, merging and arithmetic functions required for a given operation without any change of reels of tapes, etc. The results may be transferred to exchangeable disc files or other output means. The input data on such inner main storage may likewise be compiled from exchangeable disc files or other input means. Other steppers, additionally positioned in the file above the disc storages, permit the acceptance of input data from various input terminal sources, with time shared storage and multiplexing means. Thus, the updating of data for production, floor, shop, store, scheduling, receiving area, purchasing and cost accounting may be continuously affected by this part of the file with short time cycles of sorting and merging-in of such data in coordination with the other data. There may also be a link to archive type files for input and output.

Other steppers may provide storage areas for independent print, display and other output, and storage areas for interdepartmental communication.

Register tracks for tabulating, and other arithmetic, editing and similar functions may be provided, as well as program and format tracks for selective operation of programs for various record formats and various processing functions.

The cooperation of the cyclic storages with a hierarchy of higher speed delay line, small static, or other registers, permits the performance of most of the known computer functions at excellent performance rates at low cost. The interlaced, multiplex use of the storages and components permits the attainment of high performance rates by simultaneous serial operations instead of the sequential program selection and processing functions of large core memory operations.

A principal objective of the present invention is to provide personalized computers with personalized files within the area of responsibility of decision, in which all the data which have otherwise to be communicated between a complex central multiplex operation with terminals or by print, can be stored directly in the machine language of the file, eliminating unnecessary print-out, since the file is sorted in the same manner as a tabulating list. Thus, in this type of personalized operation, the operator has random sequential access to the listing of data required at any time for video use in an individual case by inserting the corresponding exchangeable file into the system, if it is not yet in, or by transferring this information to other places. It is of great advantage that the data are already directly available in machine processable form instead of only long print-outs. A print-out is generally only required for summary and exception data and for other such sequences of records as are required for video use.

An object of this invention is therefore to provide a complete satellite system of smaller personalized computers, in which a group of smaller computers cooperate with each other in a wire network for the exchange of data required at other places but in which there is a great deal of flexible, individual control over the files, responsibility for the file data and their processing and the time schedule of such computers. This does not prevent programming assistance from a central method center, but it eliminates a good deal of the complexity of the data handling of the machines in the center and permits the building of the satellite computers with simplified, administrative type programs. This leaves a good deal of incentive, interesting and responsible operations within the various managerial levels of companies, according to the principles of multiple management and management by exception.

Some operations for which random-sequential systems are especially useful are described by the following examples.

B. *Reference files*

FIG. 1 is a survey, in block diagram form, of the handling of data in reference and operative files for information units (records) referring to planning, control, and various up to date report periods and their relationship to each other. Charts I to IX illustrate details of the information handling illustrated in FIG. 1. FIG. 1 is a diagrammatic presentation of two types of file operations, named for the purpose of this description the "reference file" A1 operation and the "operative file" B1 operation.

The reference file A1 comprises reference records for the assembling of detail information or records A3*a* and A3*b* and detail information or records A4*a* and A4*b*. The reference records may comprise groups of records often used for decision-making functions, and indicated as group A3*a* and groups of records rarely used for such functions, and indicated as group A3*b*. Similarly, the detail information or records may comprise often used groups of records A4*a* and rarely used groups of records A4*b*.

Depending upon the volume of information units and on the ratio between often and rarely used items, different types of file storages may be used for often and rarely used data, as hereinafter described, if this permits still more economical solutions (see FIGS. 55 and 56). The reference records A3*a* and A3*b* for assembling detail records and the detail records A4*a* and A4*b* themselves may be updated by introducing new supplementary records A5*a* and A5*b* for assembling of detail information to replace old records A6*a*; the old records concerning, for example, parts which are no longer used due to obsolescence, for detail informations A6*a* and A6*b*, respectively.

The reference records usually contain two or three types of information. One type of information may be information which is required for rearranging, merging, searching and arithmetic, which may be devoid of interpretative information and may be only of a short digital type and used during the major part of the processing. A second type of information may be interpretative information which is required or useful for human communication and interaction and which is stored as a sequence of coordinated character sequences in bit form. A third type of information may be video and/or other information related thereto such as, for example, drawings or explanations.

Although in many cases the major part of the processing may be accomplished internally with shortened records of the first type of information, intermediate or final results often require supplementary information from the reference file of the second type of information, or of the third type of information.

Records shown in the following examples in the form of a vertical distribution pattern for days, etc. may be accumulated into various report periods such as, for example, weeks, quarters of years, etc., and may be placed in horizontal fields of records or information units if such records have identical key fields.

The splitting of file handling into groups of informations or records may be used in various ways. First, it is obvious that the file records will usually keep separately various types of records, which include different types of information and may therefore not be sorted according to identical key fields or key field combinations in an ascending or descending order. Within such correlated types of information units, provisions for a split may be made by identifying selected records of such information units by special marker code. The selected records may indicate, for example, items which are known to require special attention, due to their high value, their critical supply condition on the market, special difficulties in production or sale, or due to their design and probability of alterations, etc. On the other hand, the information units may be identified by the computer operation itself, such as certain variances from given standards or budgets. These records or information units may indicate, for example,

items behind schedule, overdrawn, overdue, above or below, over or understocked plan, out of intended sequence, etc.

In planning and control operations, provisions for a split may also be made between information units or records for the established or the basic plan or control schedule; records with new evidence, which apply or may result in modifications of the established or basic plan records; selected records of the established or basic plan group which may be used in several tentative or conditional runs and rearrangings to determine the optional reaction to the new evidence records; and modification records for the established or basic plan group, which are supplementary to the records of the established or basic plan group and are therefore utilized automatically in addition to the basic plan group. This may be effected by a mark in the basic plan group records, or, if they are not voluminous, by a search operation for modification before the basic plan group records are used.

For the purpose of simplification, the up-dating of the basic plan file by the modification records by merging them with the basic plan file may be accomplished only in determined intervals such as, for example, days, weeks or months, dependent upon the prevailing conditions, but the requirement of complete up-dated usage of the file system is achieved by the automatic combination of the basic plan file and the modification file. In simple up-dated file operations such as, for example, ledger files for personal accounts, accounts receivable and payable provisions, a split within the file system may be made between records sorted according to key fields, representing, for example, account numbers, on a daily basis, and merged into the monthly transactions, which are printed out as statements at the end of the month, and including as latest balance the balance of the end of the last day, but permitting, if required, random access to the detail information assembled up to date for the particular account number. The split may be randomwise, according to timely occurrence such as, for example, recorded transactions of the day, tested in case of an inquiry for detail information for information sorted according to key fields. If information is additionally requested, the split may be of one short record per account number, including but a few informations, in addition to the account number and latest balance, comprising sums and balance, such as indicators for overdrafts or other conditions requiring special attention or special operations, but having no accumulated detail information for the period not yet printed out. The split in the file operation may also be used for automatic auditor trials in ledger file processing, as hereinafter described in detail (the description for FIGS. 139, 140 and 141).

This type of splitting of the file operation permits the observance of all management rules, which are generally determined by the principles of multiple management and management by exception. Reference records may be used for various operations such as, for example, as search records for random files to determine the location of detail records in index search operations. In its simplest form, this may be accomplished by short key and location identifier records. The search may be broken down into one and more steps, a first one, which may include a selection of all key fields concerned, and an additional operation for selecting the desired key field combination. Reference records may also be used as reference records in random-sequentially oriented files in which the indexing may refer only to sequential record groups or key field indexes for the first record in a track or in a combination of a group of tracks. Another use for reference records is as reference records in random-sequentially oriented files, in which selected ones are used to build up with other reference or detail records new sequences of groups of records, thereby producing newly composed sequences of records including digits and text for ordering, scheduling, reporting, etc., for example, with eventually a number of levels of report producing and alternation. Various examples are illustrated in Charts I to IX.

Detail records may be used in such files either as single random-wise located records in random files, or as sequentially sorted records, which are sorted and merged into groups of key field numbers. The sequentially sorted records may comprise, for example, ledger type information collated under account numbers for later up-dated print out, but with available random access during the collating time period. The sequentially sorted records may comprise bills of materials or operation plans, and may comprise scheduled sequences of information units for production, purchasing, financing, cost accounting, sales forecast and controlled sales promotion, esc., as illustrated in greater detail in the examples presented in Charts I to IX.

The use of the reference file may be illustrated by describing the reference and detail records in a production planning and control operation. The reference information for the planning and scheduling required to produce the requirement of material, manpower, equipment and tools, broken down into time periods, and to check such requirement with available stock on order, manpower and equipment capacity available, and to adjust both requirement and availability of coverage in a continuous feedback loop system, may be shown, for example, for a product consisting of sub-assemblies and parts (Chart I).

CHART I.—REFERENCE FILE RECORDS

[For production planning and control order schedule and bill of materials for final assemblies]

Type of Information Unit (abridged):		Must Be Available Time Units (e.g. days) Before Shipping Day
Order Number	3 Products of 1460-210 (19) 60-262	
Assembly, Shipping Day:		
Main Unit Number (consisting of):	1-273026.000.01	
3 Pieces Sub-Assembly Number	034.216-210.05	30
1 Piece Sub-Assembly Number	016.324-120.03	30
2 Pieces Sub-Assembly Number	036.215-080.01	20
3 Pieces Part Number	127.336-012.02	10
(+)1 Piece Part Number	New Number	20
(−)2 Pieces Part Number	127.316-010.04	—

The product may include, as Chart I shows, the main standard features (273,426-000.01) consisting of:

3 pcs. sub-assembly number 034.216-210.05
1 pc. sub-assembly number 016.324-120.03
2 pcs. sub-assembly number 036.215-080.01

The product may also include, as optional features:

3 pcs. part number 127.336-012.02

and as a special feature:

Plus 1 pc. new item part ..... New number

instead of:

Minus 2 pcs. part number 127.316-010.04

The standard time schedule indicates that sub-assemblies 034.216-210.05 and 016.324-120.03 must be available in the final assembly area 30 time units (for example, 30 days) earlier than the assembly completion or shipping day. Sub-assembly 036.215-080.01 and the new part must be available 20 time units earlier, and part number 127.336-012.02 must be available 10 time units earlier, in order to guarantee delivery "on time."

CHART II.—REFERENCE FILE RECORDS

[For production planning and control bill of materials for sub-assemblies]

Type of Information Unit (abridged):	Design Status	Beginning With	Until
	.02	Serial Number	Serial Number
	.04	Serial Number	Serial Number
		Must Be Available Time Units (e.g. days) Before Assembly Day	
Sub-Assembly Number	034.216-210.05	30	
2 Pieces Part Number	216.014-034.03	10	
1 Piece Part Number	632.134-012.01	15	
5 Pieces Part Number	337.216-137.04	15	
3 Pieces Raw Material Number	7.316.214	10	
1 Piece Raw Material Number	2.136.116	10	
and so on			

The reference records for the assembling of the detail information indicates, as illustrated in Chart II, that

1 sub-assembly number 034.216-210.05

consists in turn of:

2 pcs. part number 216.014-034.03
1 pc. part number 632.134-012.01
5 pcs. part number 337.216-137.04
3 pcs. raw material number 7.316.214
1 pc. raw material number 2.136.116

and that its standard time schedules are 15 and 10 time units (for example, days) before completion of the sub-assembly.

The last two digits of the sub-assembly or part number may indicate the status of alteration in the design. Special references are to be recorded, which indicate until what time or up to which serial number such design is to be used, for example:

Sub-assembly 034.216-210.03 beginning with . . . until . . .
Sub-assembly 034.216-210.04 beginning with . . . until . . .
Sub-assembly 034.216-210.05 beginning with . . . until

systems requiring good reaction times and operating under the principle of management by exception.

Examples for planning and control are shown for the areas of production, finance, cost-accounting and sales, and for up-dated reporting for the areas of ledger files and other accounting data.

Operative File for Planning, Control and Up-Dated Reporting in Production Planning and Control

The use of the reference information records A3a and A3b of FIG. 1, shown in more detail in Chart II, and of the detail information records A4a and A4b, shown in more detail in Chart III, produces together with the production scheduling information A7, shown in more detail in Chart I, the first summary B4 of planning information in the operative file B1 by the selection and selective multiplication of the detail information for assemblies and parts B2 per assembly level, and by sorting and distributing such records to the planning periods B3. The scheduled times for planning periods are determined in this example by substracting the required standard lead time units (for example, days) from the shipping, calculated assembling or completion date of the assemblies or parts.

In the preparation of part requirements, and operation schedules, the 3 pieces of product 1460-210, which are

CHART III.—REFERENCE FILE RECORDS

[For production planning and control operation schedule for parts]

Type of Information Unit (abridged):	Title	Must Be Available Time Units (e.g. days) Before Completion
Part Number	Control Lever	
Raw Material	Steel Shaft (measurements and quality).	10
Operation 1—Machine group,	Turning (time required)	5
Operation 2—Machine group,	Milling (time required)	5
and so on		

Chart III illustrates the reference records for the details themselves, listing for parts which are to be manufactured the raw material and operations, namely for part number 216.014-.03. These are:

Raw material "steel shaft" 3.216.031 and measurements
Operation 1 "turning" on machine group 314.000 and time required
Operation 2 "milling" on machine group 136.027 and time required etc.

The standard time schedules may be 10, 5 and 5 time units etc. before completion of the part.

By means of the reference records, the input records for the individual schedule A7 of FIG. 1 develop the planning information units in the operative file B1. The scheduling records generally indicate, as Chart I shows, the number of units, which is 3, the order number, which is 1460-210, and the assembly or shipping year and day (19)60-262, as well as the main, optional and special features hereinbefore described.

C. Operative files

The special advantages of random-sequential file handling become especially apparent in the processing of planning, control and up-dated report information in to be shipped on day 262 (Chart I) will each require 3 pieces of assembly #034.216-210.05, 30 time units (for example, 30 days) before completion date. Therefore, 3×3 or 9 pieces of assembly #034.216-210.05 must be available on day 232 (day 262 minus 30 days). According to Chart II, the sub-assembly of each two pieces of part #216.014-034.03 requires 15 days for its completion, so that 9×2 or 18 such parts must be available at day 217 (day 232 minus 15 days).

Since the steel shafts required for the machining of the part control lever, 216.014-034.03 must be available 10 days before the availability of such parts for the sub-assembly (Chart III), 18×1 or 18 steel shafts must be available on day 217 minus 10 or 207, to meet these requirements.

It is evident that not everything in a plant follows the original scheduling, nor is the capacity used in the best manner or available at the right time for all such requirements. A flexible and adaptive planning and control operation therefore requires a constant feedback loop system B3 to B9 in the information retrieval and processing for the planning and control period. This requires, while a great amount of information 100 to 200,000 information units or records, even in a medium size operation, retrieval access to sequence of information records arranged se-

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quentially according to assemblies, parts, departments, equipment, in scheduled periods, and it requires selection and rearranging of such information.

The automatic processing of the comparison of the requirements of parts, assemblies or tools, their availability in stock, supply by vendor or own shop and the comparison of required manpower and machine time and capacity for the various places of the shop and the floor will indicate in the summary B4 of the requirement and availability either the ability or the inability to perform the operation according to the intended schedule or an economic or uneconomic use of available capacities. This may be shown by greater positive or negative balances between requirement and availability for either assembled parts, tools, manpower or facilities for the periods calculated in quantities, and, as far as required in accounts.

The use of the random-sequential type of operation may keep the total of the preparation of requirements and scheduling of parts and operations in a current up-dated condition with the possibility of selectively rearranging fractions of such information without losing their mutual conditional timed relationship. This may also avoid the necessity for rerunning the entire operation in periodic cycles as in data processing systems now utilized for such purposes.

The items in which greater differences occur are collected in special file storage areas and listed as exception detail information B5 and exception summary B6. These items require action, either by buying from other vendors, producing them in other shops, or by other facilities, using other material or parts or changing the time schedule. Effective planning and control requires the ability to first hold the change influencing information units in a separate area of the file system, in order to permit the evaluation of the consequences before they become effective. Until the best solution of the problem is found, a series of selective rearranging operations may be required.

Management games may be accomplished with selected information units within the loop of information B3 to B9. In the information feedback loop system a continuous adjustment to the occurring requirements is achieved with as small a reaction time within the feedback loop system as economically possible. The planning period may refer to a period of about one year or several months ahead, but the nearer the scheduling time, the more dangerous and difficult are the changes, and the more important is a small reaction time with rapid access to information and rapid processing. This refers also to engineering changes by new design A5 and obsolescence A6 information.

CHART IVc.—OPERATIVE FILE RECORDS

[For production planning and control planning information survey—Bottlenecks (exceptions)]

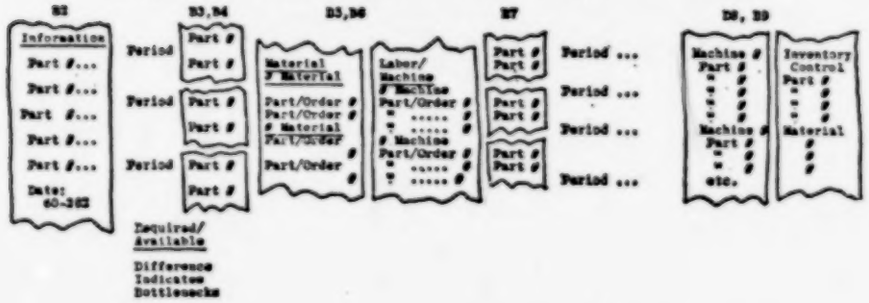

CHART IVb.—OPERATIVE FILE RECORDS

[For production planning and control planning information for parts requirement availability]

	Total	Variance Percentage	Periods (e.g. Weeks) 1	2	3	4	5	6	7	8	9	10	11	12	13
Part #															
Requirement															
Product/Source 1															
Product/Source 2															
Product/Source 3															
Product/Source 4															
Product/Source 5															
Product/Source 6															
Requirement Gross			Breakdown according to exception rules for "high value and other critical items" and any "missing," "overdue" or "surplus" items.												
In Stock															
Requirement Net															
Suppliers 1															
Suppliers 2															
Suppliers 3															
Suppliers Total															
Balance Forward															
Available															
Requirement Gross			Broken down, if required according to sources												
Withdrawal															
Variance															
Supplier, Promise			Broken down, if required according to suppliers												
Supplier, Supply															
Variance															
Part #															
. . . . .															
. . . . .															
. . . . .															

CHART IVa.—OPERATIVE FILE RECORDS

[For production planning and control planning information for facilities requirement capacity]

	Total	Variance Percentage	Periods (e.g. Weeks) 1	2	3	4	5	6	7	8	9	10	11	12	13
Facility (Group) #															
Requirement															
Product/Source 1															
Product/Source 2															
Product/Source 3															
Product/Source 4															
Product/Source 5															
Product/Source 6			Breakdown according to exception rules for "high value and other critical items" and any "missing," "overdue" or "surplus" items.												
Requirement															
Total Capacity															
Balance Forward															
Available															
Facility (Group) #															
. . . . .															
. . . . .															
. . . . .															

Charts IVa to IVc present the preparation of information for production planning and the breakdown of the details for requirement and availability of parts, man and machine operations per period in vertical grouping of the details per time period or date. The hereinbefore described loop selectively up-dates, by its random-sequential operation, any information which requires a change and thereby up-dates the great quantity of information without the need for rearranging the total information in sorting and other processing operations. Thus, instead of complex rescheduling and up-dating, a constant follow-up of the existing conditions may be achieved, which results finally in a surveyed effective planning and control. The vertical information of Charts IVa, IVb, and IVc may be grouped into horizontal periodic report rows. The charts only indicate principals, not specific forms or detailed solutions.

The planning information for the month, weeks or days ahead B10 and the current survey of the day is basic information required for the control period. It uses the detail information for the control periods B11 (parts for the assembly floor, material and operation for the machine shop), checks availability and timing and controls the final release orders (claim checks for material and labor) and instructions to store and shop. The sequence of operations may be determined by sequence numbers. The automatic survey of the operations and material release permits sorting according places of operation B12 and automatic time correction under transfer of the dependent timing sequences into other time periods by addition or subtraction of time unit delays and rearrangement of the corrected records. Summary data B13 and feedback loop operation result in controlled release of the information B16 to terminals B15 in the storage, floor and shop areas. The control may be accomplished by machine identifiable claim checks, transport checks, etc., operation slips preferably released by tele-transmission for machine shops, assembly floors, and stores which in large operation may have small computer units of their own, to control and survey the performance of their operations B16, B17, B18, if this is not accomplished by the unit in the production control center.

Since every planning or control is only reliable if a constant feedback loop comparing planned and actual operation is established, a continuous comparison B17 between scheduled or intended performance B16 and actual performance B18 is provided. In the continuous comparison, there is continuously reported back in machine readable form information indicating what is performed by whom and where it is performed B19 and in which there is constant comparison of planning and performance data and any exception, in which plan and performance disagree, is automatically reported.

For the various types of managerial decision levels the current comparison between plan and actual reporting on variances in quantity or time, or multiplying quantities and times with standard costs, variances between planned and actual performance in cost figures may thus become available in any desired detail, in listings indicating summary and exception information for planned or budget, actual and variance figures B21 to B23. The report periods for the reports B20 may be cycles within the day, for example, hourly cycles, weekly or monthly cycles in dependence upon the type of information and the reporting levels concerned, and in dependence upon the importance of the variance B23.

With inventory control, the comparing information includes details of coverage (availability in stock and on order) broken down into periods and compared to requirement, comparison between individual vendor or shop promises and actual supply for the various items, and comparison between planned requirement and actual withdrawal of the various sources requiring such items. (See Chart IVb.) Special emphasis is given to the availability in time of parts for the assembly lines. (See Chart Va.) Units of the subcomputer units may be in the purchasing department or satellite system for ordering and follow-up and terminals or stations may be provided in the receiving area to permit continuous information feedback loops and to avoid late discovered shortages.

CHART Va.—OPERATIVE FILE RECORDS

[For production planning and control—control information for floor (sub-assemblies and assemblies)]

Department.... per day.....year	Periods (e.g. days/weeks) Total	1	2	3	4	5	6	7	8	9	10	11	12	13
Product/Assembly #														
Total Plan up to day ...		Lists only "complete availability".												
Part # surplus deficiency														
Part # surplus deficiency		Lists only "high value and other critical items" and any "missing", "overdue" or "surplus" items. (exceptions)												
Part # surplus deficiency														
Part # surplus deficiency														
. . . . .														
. . . . .														
Product/Assembly #														
. . . . .														
. . . . .														

CHART Vb.—OPERATIVE FILE RECORDS

[For production planning and control—control information for machine shop]

Machine Group	Day	Schedule Permits Sequence	Order #	Piece #	Title	Routing Department/ Tool Required	Operation Time Set Up	Operation	Deliver To	Time Scheduled	Actual	Variance
# ..	113	21										
....		22										
....		23										
....		24		Regular.								
....	116	25										
....		26										
		14		Listing separate out of sequence, "rushing", "overdue" or advance item.								
		15										
		25										

Machine Group #.... ....

As indicated in Chart Vb for the machine shop scheduling, feeding the parts at the proper time to the proper place and automatic checking of quantity performed, scrap control, and feedback loop control for the completion of sequential operation may be achieved in cyclic computer operations within the day to permit the best possible production in the plant. Any variances are detected and reported and adaptive control decisions under human control or intervention are immediately possible.

As soon as the period of direct intervention is over, the daily informations, sorted accordingly, are merged day by day into weekly informations, and the weekly informations are merged into monthly informations, and summary and exception reports are made for various management levels and reporting cycles (B20 to B23).

Plan or budget figures B32, together with actual data B33 and variance data B34, with special emphasis on summary data B31 and exception data B36 are currently developed during the first history reporting period, preferably during the week or month (History period I). Summary and detail reports B31 and B35 may be provided for the next history period (History period II) in a conventional manner according to the requirements of analyses and availability B41, but with the capability of direct access to the information data in machine language for further processing, if required.

CHART VIa.—OPERATIVE FILE RECORDS

[For financial planning and control for payments to be made]

In Bookkeeping: Accounts Payable
Amounts to be Paid:
Period Due, Item Group 1 (e.g., Bottleneck Material .....)
Account #.....
Invoice ..... Date, Text, $.....
Invoice ..... Date, Text, $.....
Account #.....
Invoice .....
Item Group 2 (e.g., Other Material)
Account #.....
Invoice .....
#.....
Item Group 3 (e.g., Payroll)

Since there is a considerable difference in the different item groups with respect to the flexibility of the requirement for keeping the original intended due date for payments such as, for example, inflexibility in the date of payment of salaries, telephone bills, utility bills and special critical items such as bottleneck material, taxes, etc., a constant grouped survey with rearranging capability is highly desirable. It may be of the type shown in principle in Chart VIa. Individual discussion with vendors may in such cases require random-sequential access to accounting detail data. If automatic check printing is an included feature, considerable data transfer even in the very last days, may be required.

CHART VIb.—OPERATIVE FILE RECORDS

[For financial planning and control for payments to be received]

In Bookkeeping: Accounts Receivable
Amount to be Received, Has Been Received, Has Not Been Received, (Due Amounts Statements)
Period Due, Account # ..... (Has Not Been Paid)
Invoice (A) Equipment 3-20-60 $.....
Invoice (C) Equipment 3-28-60 $.....
Down for Invoice 3-28-60 $..... $.....
Account # .....
Invoice .....
Invoice .....

Other sequences for periods due may become necessary and daily up-dated data in collated "historic" random-sequential ledger file.

As Chart VIb indicates, similarly grouped informations with random access to sequential ledger type data may be of great value for the survey and follow-up in the area of the accounts receivable. Individual sales and financial discussions with customers, especially potential customers, very often require random-sequential access to such accounting detail data. If statements are to be sent out for the selected due amounts, customer service requires the updating of the figures including the latest received payments.

Operative File for Planning, Control and Up-Dated Reporting in Financial Bookkeeping

In principle, the same rules described for planning and control apply to financial bookkeeping. The bottleneck in the case of financial bookkeeping is money, rather than manpower, facilities, parts and materials, and it is of great importance since it is usually not available in abundance.

During the planning period, details for the financial budgeting require in general considerable rearranging of data as soon as investment for new facilities, changes in the production program or other projects of special consideration are to be performed.

Summary figures, derived from the normal data transfer may be used for general data, but a very detailed budgeting and observation of the actual data and of eventual variances, divided into periods, is required for the exception data. Very often, but especially in such conditions, there may arise during the control period a considerable need for rearranging of intended payments, even for general data items under human intervention or control.

Operative File for Planning, Control and Up-Dated Reporting in Cost Accounting; Budget and Standard Information

Modern budgeting and standard cost techniques require the ability to make flexible adjustments of given budgets under constant survey of the details of adjustments and variances and combining the basic budget or standard figures from which the data originates. This refers to the complete spectrum of budgeting and standard cost techniques, with special emphasis on critical items in material, labor and overhead costs.

CHART VIIa.—OPERATIVE AND UP-DATED FILE RECORDS

[For budgetary planning and control]

Planning, Control: In Cost Accounting:
Summaries: Cost Item # | Budget | Actual Data | Department # | Variance | # ..... Actual data in comparable or following sequential periods.
Report Information
Details: For selected items departments for detail explanation of summary figure if variances are too great or if comparison and other reasons require detailed survey or controlling influence.
Standard Variance: Cost of Product #..... | $ | Material | Labor | Tools, etc. | Overhead 1 | Overhead 2 ..... | Total
Product #.....

For the various departments and product areas, the summary surveys for budget, actual and variance data, such as, for example, according to Chart VIIa, require for selected items, department etc. details for summaries or random-wise selected sequences of data forming the sum for summary surveys if required. This is required, for example, if variances are too great or if comparisons or other reasons indicate a necessity for a detailed survey or controlling influence.

CHART VIIb.—UP-DATED FILE RECORDS

[General reports for summaries and variances]

Details in Various (2 or 3) Sorting Directions
Daily: Day 1, Day 2, Day 3, Day 4, Day 5

Report Information

Item # / Detail (a) / Detail (b) / Detail (c)	Item # / Detail (d) / Detail (e) / Detail (f)	Summaries: Item # / Day/Week/Decade	Accumulated Totals
		Day/Week/Decade 2/	1 to 2
		Day/Week/Decade 3/	1 to 3
		Day/Week/Decade 4/	1 to 4
		Monthly—quarterly company reports with comparisons for: budget—actual—variances critical in various comparable periods	
(similar to day 1)			
Merged Into Week/Decade or (Decade/Month			
Group Sum Item #			

The up-dating of report information is accomplished by sorting, as indicated by Chart VIIb. The daily activities are sorted to reference numbers, for example, and are merged either daily or weekly into daily or weekly up-dated files, merged again into monthly up-dated sequential files. The merging may be effected similarly in method to that utilized with tape files. With random access to sequences of such data, the data group beginnings or the track group or vertical arrangement of the track beginnings are indicated by index information stored within the file comprising the beginning of such groups for key fields and localities.

Operative File for Planning, Control and Up-Dated Report Information in Sales

The planning and control information technique used in the sales department determines to a high degree the rest of the planning and control information within the entire business, especially in the area of production and financial planning and control. It is an area in which computers can help management in a high degree to determine the direction to be preferably selected. Random access to sequential streams of data and their constant survey and rearrangement is of great importance.

The two extreme types of operation are sales of mass products or series of products and sales of single order products. Between the two extremes lies the wide variety of single order products, comprising serial order assemblies which require a combination of both systems for the sales and inventory planning and the control functions. The planning periods refer to trend forecasts for the year and longer periods and the breakdown of the year into the seasons within such years. Reviews and surveys with actual and other insights are constantly required within the year for detailed adjustment.

CHART VIII.—OPERATIVE FILE RECORDS

[For Sales Planning and Control]

CHART VIIIa.—IN SERIAL MASS PRODUCTION BUSINESS

Preview (Planning) of Sales and Revisions of Such Preview in Regular Time Periods
Ratios for Trend and Percentage

Period, Product, Area	Sales Yearly Product Group:	Seasonal in Group:	Within Year:	Others	Volume:	Estimated Prices 4/ Discount	Net Sales	Costs	Gross Profit	Percentage

(Revisions in time periods under control of sales offices of various areas and product sales departments)
(Requires summaries with selected details)

CHART VIIIb.—SALES PROMOTION (CONTROL)

Period, Product, Area	Agent	Main Customers, & Consumer Groups	Volume	Price	Discount	Net Sales

Plan (Budget), Actual, Variance
With feedback information influencing production planning and control and sales inventory planning and control.

CHART VIIIc.—PLANNING AND CONTROL OF INVENTORIES

Product, Area	Ratios Group-wise Turnovers:	Ratios of In:	Stock Sufficient for Periods:	Lead Time and Others:	Requirement Plan Actual	Available On Order	In Stock

Plan, Actual, Variance
(See Chart Va)

The buildup of the planning figures as shown in Chart VIIIa requires a constant and periodic survey of the ratios for the trend of the product group, its assortment within the group, and for the seasonal curves and their thorough examination by surveying the actual figures and revised estimates of various sales branches in various areas, to verify the correctness of trend and other ratio figures. Of special importance is the controlling survey of discount, returns and other variations from standard and competitive prices and of the gross profit ratios to standard costs,

which in turn requires in addition to summary figures random access to selected sequences of the details which build up the summary figures of certain of the summary figures require special attention or consideration.

The follow-up of the direction in the sales activity and the support of the individual salesmen may contribute greatly to sales success and to the reliability of sales forecast or planning figures. The access to all pertinent information for sales discussions, which may include in addition to typical sales information, as indicated in Chart VIIIb, financial and personal information about the customer and its responsible officers, requires random access to sequentially merged up-dated data.

The reliability of the sales planning data influences to a high degree the reliability in the area of sales inventory planning and control. To avoid heavy financial losses on the one hand, but to have on the other hand the proper volume of commodities at the proper place, a continuous survey, as indicated in Chart VIIIc, with access to individual detail data is required.

CHART IX.—OPERATIVE FILE RECORDS
[For sales planning and control]

CHART IXa.—SINGLE ORDER BUSINESS

Survey of Inquiries
Product, Area, Delivery Time, Estimated, Probability of, Certainty, $.....
(summaries with details for inquiry above specified amounts or for special products or customers)

CHART IXb.—SURVEY OF ORDERS

Period, Product, Area	Promised Delivery Time	Change of Promise	Actual Delivery	Budget Sales Amount	Budget Cost	Budget Profit	Actual Sales Amount	Actual Cost	Actual Profit	Variance Sales	Variance Profit

(Summaries with selected details)

In many cases, simple random access may be sufficient for the inventory survey itself, but access to analytical details for selected items, if required, about sales to individual customers and suppliers and their activity pattern with relation to time compared to forecast, etc. may result in many cases as very helpful tools for an economically effective sales inventory planning and control. The analytical data for sales planning and control are supplemented by surveys of inquiries and orders grouped into periods, product groups and products, sales areas and type of customers, as described in greater detail in Charts IXa and IXb for single order sales activity.

Planning and control of single order business requires constant survey and follow up of the survey of inquiries and orders in close cooperation with production planning and control. The survey of inquiries permits the direction of the sales efforts to special individual interest, which may vary with respect to product, customer, facilities, capacity available and profit margins. The required information usually includes the details indicated in Chart IXa. The survey and follow-up requires that any summary data may be separated into details on request, and it is the nature of such business that such requirements for details may be made random-wise at any time. Since only fractions of inquiries result in orders, continuous up-dating is required.

A continued survey and follow-up of the order information with special emphasis on price, cost and scheduling aids considerably to keep the business activity under reliable control. Weaknesses as well as strong points should be known as early as possible in order to react in time because what is missed not only immediately influences the relationship between a customer and suppliers but it influences the total future business activity. Any information of pertinence for the order and the relationship to the customer should be collated together, so that any exception to plans and agreements should be brought immediately to reported attention. Such information may include data illustrated in Chart IXb.

D. *Interdepartmental and interorganizational communication*

File economics should determine the preference for centralized or decentralized file systems or combinations of both in dependence on the individual case. Of the general rules which apply, the first is that if files which require a certain degree of up-dating are needed in the same or similar form of data organization by different users, preferably in the same company and in localities geographically near each other, they should be shared, if it is technically possible. Such files may comprise, for example, reference files (file A1 of FIG. 1) such as the address files of customers. If the file locality may be at a central geographical location, a central department or user may have the up-dating responsibility. If the information is preferably used in one department or by one user, this department or user may have the up-dating responsibility and the capability of recording and erasing data within the file, whereas selected other users may have only inquiry access to such file information. If the file volume is large, such responsibilities may be allocated to separate groups of users, each of which is responsible for certain fractions of such file data.

The second general rule is that if in operative file systems (file A1 of FIG. 1) various localities require similar operative influence to file data depending on random access inquiries such as, for example, airline reservation systems, the file systems should be shared under local decentralized intervention or control in the recording and sensing of such data.

The third general rule is that if in operative file systems (file B1 of FIG. 1) of random-sequential type, various departments or local users require individual operative influence on different file data or file data of different structure or grouping, the responsibility for recording, erasing and otherwise processing such data should be restricted to such departments or local users and selected others may have only inquiry access to such data. The decision between the use of a central file or a decentralized file system should then be made only under economic considerations.

It is an objective of the present invention to provide inexpensive processing means for sorting, merging, searching and arithmetic up-dating of file information. This is especially applicable to administrative type of file information. For such applications, the managerial systems advantage of individual responsibility and scheduling of file processing systems appears to be technically and economically attainable, since the main part of processing is not repetitive use of information stored in a random-wise accessible working and program storage, as it preferably is in mathematical routines, but in selective processing of streams of data file information transferred from one file location to another.

The potentials of the inner memory systems of universal type computers are therefore barely used whereas the systems limitations of the access to the input and output file data are obvious in central single file processing compared to parallel independent file processing.

If, on the other hand, scientific processing is the major part of operation, the use of central buffer file and computer systems may be economical. Here again, independent file processing units in the form of the disclosed invention are of great advantage as preparatory input file means and are very suitable as user-oriented means in the output channels of central systems.

Although, as hereinbefore illustrated, especially in the charts, the data required in the operative files of the various departments are very different from each other and require individual handling with respect to the required detail, grouping and timing of processing, it is apparent that the planning and control functions should have for

best results an integrated communication network between such files at various levels of activity.

The great influence of sales figures on sales inventory planning and control and on production planning and control, and consequently on the purchasing, budgeting and financial planning and control, and vice versa, is obvious, and there is a great need that computers assist in solving the complexity of these problems. This requires that the computers improve:

The possibilities for an integrated planning, control and up-dated reporting system,

The potential use of flexible budget, standard and scheduling systems,

The speed for detecting variances and reacting on exceptions on the managerial level,

The potentials of local planning, control and up-dated report systems with speedy and rapid reaction,

The reliability of presenting facts and their mutual dependency, and

The capacity to check various alternatives before major decisions are made and to improve or optimize the efficiency of such decisions.

It is apparent, however, that not every change in an operative sales file, requires a change in financial, budgetary or production planning; just as many changes in production planning and control do not influence the sales or financial planning and, as many financial planning changes do not influence the current sales and production planning and control, although some do. One common file containing all the data and fulfilling all these complex requirements simultaneously appears to be a very difficult solution due to the resulting technical and programming systems complexity, except in a very simple case. However, the application of the recognized basic management principles of multiple management combined with management by exception may result in achieving such an aim and may provide an integrated computer system for planning, control and updated reporting without having to interfere technically with such basic management principles.

A comparison may explain the principle proposed. It is generally known that it is not necessary to transmit all receipt and withdrawal transactions for all the items of inventory from all localities cross-country to one center file in order to insure that in case of a surplus of certain items at one place and a demand at another place an exchange may occur. It is only necessary that such exception information for surplus or demand be transmitted to a communicating center or at first to the nearest geographical localities for a possible interchange, and therefore for such purpose such exception information has to be locally, for example, automatically, produced.

Similarly, the departments or other organizational users may retain their authority over operative file systems if provision is made for the detection and reporting of exceptions, and if such exceptions exceed certain limits of interference with other areas of activities within an organization a decision has to be made to select this or another solution of the problem. The principal requirement is the common network and the accessibility to each information sequence, if needed.

Common and integrated budgetary and standard principles are fully applicable. This permits every possible freedom in deciding upon mutual interaction by setting rules, when variances have to be brought to the attention of, for example, the central controller, and he may in turn set up his own managerial rules for interdepartmental communication levels.

Auditor trails and generally applied systems methods may be set for the proper use of the individual freedom of action, but they are set by coordination of efforts by a communicating computer file system to permit operation according to the principles of multiple management and management by exception.

E. *Objects*

The principal object of the present invention is to provide a new and improved data handling system.

An object of the present invention is to provide a completely dynamic data handling system.

Another object of the present invention is to provide a new and improved data handling system which provides results similar to a punch card system.

Another object of the present invention is to provide a new and improved data handling system which sorts, collates, tabulates and calculates similarly to a punch card system.

Another object of the present invention is to provide a new and improved data handling system which functions substantially as a complete dynamic computer as opposed to a static memory computer.

Another object of the present invention is to provide a dynamic data handling system which is inexpensive and rapid in operation relative to a static memory system.

Another object of the present invention is to provide a dynamic data handling system which is highly accurate, efficient and reliable in operation.

Another object of the present invention is to provide a dynamic data handling system which performs operations in a number of selected information tracks simultaneously.

Another object of the present invention is to provide a dynamic data handling system which performs a number of functions simultaneously.

Another object of the present invention is to provide a dynamic data handling system which selects information from a number of different tracks simultaneously, merges the information and transfers the merged information to another track.

Another object of the present invention is to provide a dynamic data handling system which utilizes switchable gates for a number of information tracks to permit the selection of information under selective control.

Another object of the present invention is to provide a dynamic data handling system which utilizes the switching of sensing heads in a number of information tracks for the selection of information under selective control.

Another object of the present invention is to provide a dynamic data handling system which utilizes a number of presensing stations for presensing information in a number of information tracks.

Another object of the present invention is to provide a dynamic data handling system which utilizes the presensing of information in a number of information tracks for selecting information for comparison.

Another object of the present invention is to provide a dynamic data handling system which utilizes the switching of sensing heads in a number of information tracks to move a head forward in effect when information is selected and to maintain the head stationary in effect when information is not selected.

Another object of the present invention is to provide a dynamic data handling system which utilizes the presensing and switching of sensing heads in a number of information tracks under joint control.

Another object of the present invention is to provide a dynamic data handling system which requires a minimum amount of programming.

Another object of the present invention is to provide a dynamic data handling system which reduces the number of intermediate storages.

Another object of the present invention is to provide a data handling system which provides new and improved random and sequential file access.

Another object of the present invention is to provide a data handling system which provides random and sequential file access of great efficiency, speed and accuracy.

Another object of the present invention is to provide a data handling system which provides rapid access to updated or up-to-date files.

Another object of the present invention is to provide a dynamic data handling system in which groups of informations are controlled as groups.

Another object of the present invention is to provide a dynamic data handling system which eliminates the need for cores.

Another object of the present invention is to provide a dynamic data handling system which arranges informations fed in sequential order and processes informations in sequential order so that the input and output informations may be prepared for arithmetic operations.

Another object of the present invention is to provide a data handling system which eliminates idle runs.

Another object of the present invention is to provide a data handling system which utilizes the sequential order sorting of informations and permits direct access to selected information.

Another object of the present invention is to provide a data handling system which utilizes arithmetic operations which are executed at great speeds in short time periods and therefore entail little expense.

Another object of the present invention is to provide a dynamic data handling system in which informations are interlaced with each other.

Another object of the present invention is to provide a dynamic data handling system in which informations are dynamically shifted back and forth to obtain fixed fields from variable fields.

Another object of the present invention is to provide a dynamic data handling system in which fixed fields are compressed to position them closer together.

Another object of the present invention is to provide a dynamic data handling system in which delay lines are synchronized with rotating memories.

Another object of the present invention is to provide a dynamic data handling system in which informations and program are presensed.

Another object of the present invention is to provide a dynamic data handling system which utilizes a revolver in combination with controlled delay time and interlaced channels.

Another object of the present invention is to provide a dynamic data handling system in which selected fields make program decisions.

Another object of the present invention is to provide a dynamic data handling system which utilizes delay lines to sort selected fields and to shift fields to fixed field conditions.

Another object of the present invention is to provide a dynamic data handling system utilizing a new and improved fixed delay line.

Another object of the present invention is to provide a dynamic data handling system utilizing a new and improved stepwise controllable delay line.

Another object of the present invention is to provide a dynamic data handling system utilizing a new and improved parallel revolver arrangement.

Another object of the present invention is to provide a dynamic data handling system in which the sequence of fields in a track is changed in a sorting operation.

Another object of the present invention is to provide a dynamic data handling system having a great input capacity.

Another object of the present invention is to provide a dynamic data handling system having an asynchronous input.

Another object of the present invention is to provide a dynamic data handling system utilizing a new and improved unlatched keyboard arrangement.

Another object of the present invention is to provide a dynamic data handling system utilizing a new and improved printer arrangement.

Another object of the present invention is to provide a dynamic data handling system utilizing a new and improved disc and disc mounting arrangement.

Another object of the present invention is to provide a new and improved two way comparator circuit arrangement.

Another object of the present invention is to provide a new and improved three way comparator circuit arrangement.

Still another object of the present invention is to provide a dynamic data handling system having new and improved circuit arrangements which may be utilized as components thereof.

The dynamic data handling system of the present invention provides considerable advantages over static memory computers and especially core memory computers. It is considerably less expensive to record in a track of the data handling system of the present invention as opposed to a core. The data handling system of the present invention may perform a number of functions simultaneously whereas a core memory can only perform a single function at a single time. The instructions for the core must first be prepared and put in the program. A part of the core memory must then be addressed. Then the instructions must be read out and fed to a register and the register must be instructed. The core operation is thus a slow one.

The core driver system is very expensive and can do only one thing at a time with the core. The entire memory performs only one function at a time and its speed is in the range of 500 kilocycles to one megacycle. The data handling system of the present invention has a greater speed than the core memory relative to its size and does not utilize driving since it has no need for driving: the information being arranged in said data handling system in sequential order. The need for cores is eliminated by direct synchronization of storages.

In presently known computers, the information is stored in different registers and the program has to direct all the operations. Due to the storing of informations and result in separate registers, elaborate programming is necessary to obtain results. In the data handling system of the present invention, the data is recorded in sequence in a track and is therefore readily accessible, thereby reducing necessary programming. The program has merely to direct addition or subtraction and to select an output position.

In the data handling system of the present invention, each field is recorded in a specific position. The program is recorded one field ahead, so that selected data is directly handled and data handling is achieved with facility. Programming is very easy and different programs are very easily coordinated.

The arithmetic operations of the data handling system of the present invention are achieved in less time and at greater speeds than presently known arithmetic operations and therefore entail considerably less expense than known arithmetic operations.

In tape systems, wherein information is stored in tracks, there are necessarily idle runs. The data handling system of the present invention permits the bypassing or jumping of undesired or unnecessary areas of information. The data handling system of the present invention thus retains the advantages of tapes, such as, for example, sequential order sorting, and combines these advantages with the advantages of a file, such as, for example, direct access to a selected information.

The files utilized in the data handling system of the present invention may be changed like tape reels because there is no need for access to all the parts of the memory simultaneously. This is due to the fact that the parts of the memory are in sequential order and the operation is only in a fraction of the memory. The cost of the files is thus reduced, since otherwise, all the informations would have to be directly accessible.

A tape has a surface space of only about an eighth of a file surface space at full speed rotation. The files of the data handling system of the present invention have the

CLAIMS

* * * *

20. A record-keeping machine system for financial accounts, said system comprising a data processor including a memory for storing combinatorially coded signal records: a processor for combining and comparing the coded signals of said records; input and output devices; and a control system for supervising and directing said other parts of said data processor to perform a certain sequence of operations; said memory including a storage file of a plurality of machine-readable records formed of coded combinatorial signals, a master section of said file including a plurality of predeterminedly sequenced sub-files of said records, each said sub-file including a different signal group record for a certain one of a plurality of account identifications, a plurality of predeterminedly sequenced different signal group records for different record-keeping category codes individually associated with each of said account identification records, a plurality of different group records each for an amount total associated with a different one of said category records, and a plurality of totalizing operation records individually associated with certain pluralities of said category records and sequenced with the associated category records, a transaction section of said file including different pluralities of sub-files of said records, each of said transaction sub-files including one of said account identification signal group records, one of said associated category signal group records, and a separate transaction amount signal group record associated with each of said category records; said control system including means for directing the processing of said files in accordance with the predetermined sequences of said master sub-files and of said category records of each sub-file, and processing directing means including means for locating in said master file section, for each of said transaction sub-files, that one of said category records corresponding to the transaction account identification record and the transaction category record and for augmenting the associated master amount total record by the amount records of the

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corresponding transaction sub-file; and means for producing an output record for each of said master sub-files, said output record producing means including means for identifying each of said master sub-file category records and for producing an output listing of the sub-file category codes and of the associated category amount total from said records, means for directing the accumulation of the amount totals of successive ones of said category records, and means for identifying each of said totalizing records and for producing an output record of said accumulation of totals of the preceding category records.

21. A record-keeping machine system as recited in claim 20, wherein certain of said master sub-files include totalizing records of a plurality of different types, and wherein said accumulation directing means includes means for directing a plurality of different accumulations of said category amount totals respectively associated with said totalizing record types, and said totalizing identifying and output means includes means for producing output records of respective ones of said accumulations in accordance with the different types of totalizing records, and means for directing the resetting of the associated accumulation for certain ones of said types.

22. A record-keeping machine system as recited in claim 20, wherein a plurality of said master sub-files further includes a plurality of different signal group records each providing a coded individual description of a different one of said category and totalizing records; said output record producing means including means for producing an output record of each of said individual descriptions with the output of the associated category code and total.

23. A record-keeping machine system as recited in claim 20, wherein said control system includes means for directing the addition to a specified one of said master sub-files of a signal group record for a record-keeping category code and for controlling its insertion in proper sequence with the other category records of the specified sub-file, and for directing the deletion of a specified record therefrom, whereby the record-keeping system of each account may be individually modified.

24. A record-keeping machine system as recited in claim 23, wherein said addition and deletion directing means includes means for modifying said amount total record of a specified one of the category records, whereby errors in the records of each account may be individually corrected.

• • • •

Patent Appeal No. 9088

NOTICE OF APPEAL TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS, DECEMBER 28, 1971.

Hon. Commissioner of Patents
Washington, D.C. 20231

Sir:

Appellant hereby gives notice of his appeal to the United States Court of Customs and Patent Appeals from the decision of the Board of Appeals rendered on or about October 27, 1971, which decision reversed each of the rejections (which were based on 35 U.S.C. 101, 102 and 112) advanced by the Patent Examiner below and entered new rejections of claims 1 through 11 and 16 through 27, inclusive.

The following are assigned as reasons of appeal:

1. The Board of Appeals erred in failing to allow claims 1 through 11 and 16 through 27 and in entering new rejections of those claims.

2. The Board erred in its summary statement of appellant's invention by omitting important features thereof.

3. The Board erred in holding that the details of the disclosed machine-readable program for a computer "are not brought into issue in this appeal by reason of the character of the claims presented."

4. The Board erred in holding that the claims are "either to a method of bookkeeping . . . or to apparatus that automatically carries out . . . the steps of the bookkeeping method."

5. The Board erred in holding that all of the aforementioned claims fail "to point out and distinctly claim that which appellant considers to be his invention" and therefore that the claims fail to meet the requirements of 35 U.S.C. 112, second paragraph.

6. The Board erred in holding that appellant did not consider his invention to be the use of a form of automatic data processing "for the financial record-keeping and statement-furnishing operations of a bank."

7. The Board erred in holding that "the appealed claims, both apparatus and method [are] not directed to improved record keeping machinery, but rather to a broad system of keeping financial records."

8. The Board erred in holding "the distinction over acknowledged prior record-keeping is either in the identity of the person or institution which has custody of certain phases of the bookkeeping operation or in the financial meaning of or the relationship existing between, the various records."

9. The Board erred in holding that there is "broad sweeping reference in the claims to the automation of the banking industry," and that such reference "serves only as a dress for claims that spell out, in effect, the relationship of a bank and its customers, not any particular configuration of business machinery."

10. The Board erred in holding that the claims are indefinite under 35 U.S.C. 112, second paragraph, for "failing to distinctly point out the invention."

11. The Board erred in holding that the claims on appeal, "both method and apparatus, purport to identify record storing portions of the apparatus or method steps, only by the particular financial meaning to be accorded this data."

12. The Board erred in holding that the meaning to be accorded data "in no way can define either the construction of the data storing apparatus or the machine processing steps thereof."

13. The Board erred in holding that "there can be no structural or operational relationship of a computed memory with the meaning one chooses to assign outside the computer to a particular configuration of binary digits or 'bits' in its memory."

14. The Board erred in holding that "although a group of such bits is processed as an alphanumeric character within the computer this results from the physical states of the memory cells and manifestly this is unrelated to whether a series of such characters represents a stock number of a part or a sum of money, outside the computer."

15. The Board erred in holding that "the only identification of the meaning represented by a section of the computer memory is in the mind of the user and cannot define any characteristic of the apparatus."

16. The Board erred in suggesting that appellant "chooses to denominate a section of its memory by a term descriptive of one meaning, such as a file of stock numbers rather than a file of sums of money."

17. The Board erred in holding that all the claims are indefinite under 35 U.S.C. 112.

18. The Board erred in holding that the claims on appeal embrace, in apparatus claims or as a part of the apparatus steps of method claims, that which has been "held to be outside the scope of apparatus."

19. The Board erred in holding that the claims are "for subject matter outside the patent statutes" and therefore unpatentable under 35 U.S.C. 101.

20. The Board erred in holding that "those systems which do extend beyond the field of technology are not within the 'technological arts' and are non-statutory" and in failing to recognize that any constitutional limitation under 35 U.S.C. 101 is to the "useful arts."

21. The Board erred in holding that the *Benson et al.* decision (169 U.S.P.Q. 548) was a ruling by the C.C.P.A. "that 'liberal arts' are to be excluded from the 'useful arts' and, hence, innovations directed thereto are non-statutory."

22. The Board erred in failing to follow the ruling in *Benson et al.* that "all other types of business machines" are in the "technological arts."

23. The Board erred in holding that appellant's invention reflects "no concern for the enhancement of the internal functional of the machine."

24. The Board erred in failing to recognize that the invention of this application falls within the Board's definition of improvements in machines "that replace manual effort" and is therefore within the "technological arts."

25. The Board erred in holding that appellant's invention is outside of the "technological arts."

26. The Board erred in holding that "the claims on appeal simply specify that the bank will perform the bookkeeping and accounting services for its customers, rather than each customer performing his own."

27. The Board erred in holding that each data file in the appealed claims "is identified only as to its role in the bookkeeping and accounting system, in association with 'means' for performing conventional bookkeeping and accounting operations on the data files."

28. The Board erred in holding that the recitation of the claims "is without regard to the particular apparatus used to perform these operations and certainly with no 'enhancement' of the machine operation spelled out."

29. The Board erred in holding that there is "no essential difference in substance between the apparatus and process claims" and that they "must stand or fall together."

30. The Board erred in holding that the claims on appeal "would, in effect, grant a monopoly to appellant on a method of conducting the banking business."

31. The Board erred in holding that "banks would [by these claims] be restricted to the use of their data processing equipment only for their own bookkeeping and not being allowed to freely expand into the business of keeping books for their customers."

32. The Board erred in holding that the grant of these claims "would allow the intrusion of the patent system into the social sciences already under regulation by governmental agencies" and it "would exceed the constitutional grant of authority to issue patents in the 'technological arts'."

33. The Board erred in holding that the claims are unpatentable under 35 U.S.C. 103.

34. The Board erred in holding that the claims are "for obvious variations of . . . the system of bookkeeping by banks that was acknowledged to be old by appellant on page 2 of the specification."

35. The Board erred in holding that the claims are "for obvious variations of . . . the system of bookkeeping of the Dirks patent [U.S. 3,343,133] when applied to banking rather than industrial business."

36. The Board erred in holding that terms such as "special," "trust," "escrow," "personal" and the like are

each "a category code as called for by the appealed claims" and that the bank's treatment of such accounts "is no different than appellant accords the different category codes."

37. The Board erred in holding that appellant "merely adds the category number to the end of the account number to create, in effect, a series of different and distinct account numbers to be used during most of the data processing."

38. The Board erred in suggesting that appellant's invention is concerned with enabling banks to provide their customers "with a form of cost accounting facilities."

39. The Board erred in suggesting that appellant's invention is "merely printing the summary sheets for all the special accounts of an individual on a single document with totals for all accounts" and in holding that it "would be an obvious convenience to both the bank and the customer."

40. The Board erred in holding that the Dirks patent discloses a system in which "each area is assigned an account number in which transaction and balance files are kept and updated (column 9, lines 21-26)."

41. The Board erred in viewing the apparatus and method covered by the claims as a "bookkeeping apparatus and method" and in holding that it would be "obvious to a person of ordinary skill to use the cost accounting portion of the Dirks system of bookkeeping in the banking . . . business," and in suggesting that use would anticipate the claimed invention.

42. The Board erred in failing to construe appellant's claims in the light of appellant's disclosure, as required by 35 U.S.C. 112, last paragraph.

43. The Board erred in failing to interpret the claims "to cover the corresponding structure, material or acts described in the specification or equivalents thereof" as specified by 35 U.S.C. 112, last paragraph.

44. The Board erred in disregarding the contribution to the art provided by appellant's invention and in holding it would be outside the patent laws as unpatentable subject matter.

45. The Board erred in not distinguishing between the claims of different scope and different subject matter and in holding all of them unpatentable for the same reasons as applied to the broadest claims.

Respectfully submitted,

/s/ Morton C. Jacobs
MORTON C. JACOBS

December 23, 1971

SUPREME COURT OF THE UNITED STATES

No. 74-1033

C. MARSHALL DANN, Commissioner of Patents and Trademarks, PETITIONER

v.

THOMAS R. JOHNSON

Order Allowing Certiorari. Filed May 12, 1975

The petition herein for a writ of certiorari to the United States Court of Customs and Patent Appeals is granted.

Mr. Justice Powell took no part in the consideration or decision of this petition.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1975 587269 185

IN THE

Supreme Court of the United States

OCTOBER TERM, 1974

NO. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS AND TRADEMARKS, *Petitioner*

v.

THOMAS R. JOHNSTON, *Respondent*

BRIEF FOR RESPONDENT IN OPPOSITION

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

MORTON C. JACOBS
Attorney for Respondent
828 Suburban Station Building
Philadelphia, Pennsylvania 19102

Of Counsel:
MILLMAN AND JACOBS
David Cohen
Ralph A. Jacobs
Leonard Cooper

THE LEGAL INTELLIGENCER, 66 NORTH JUNIPER STREET, PHILA., PA. 19107 (215) 561-4050

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OBJECTIONS TO JURISDICTION

This Court, like the Court of Customs and Patent Appeals below, is without jurisdiction to review the "new use of an old machine" rejection (Pet. 15)[1] of respondent's invention that was originally made by the Patent Examiner and thereafter was reversed by the Patent Office Board of Appeals below (Pet. 28A) as contrary to the technological facts of computers. A revival of this rejection is the foundation for the petition and its proposed questions. The review called for by the petition would be an appeal by the Commissioner of Patents from his own Board's decision, which this Court in *Brenner v. Manson*, 383 U.S. 519, 523, n. 6 (1966), stated would be in violation of the Patent Code, 35 U.S.C. 141 (granting only to the applicant the right of appeal from a decision of the Board of Appeals).

The Board of Appeals held in favor of respondent on the "new use of an old machine" issue; consequently, petitioner could not and did not appeal that finding to the Court of Customs and Patent Appeals. That new-use/old-machine issue was not, and could not have been, within the reasons of appeal (R. 328);[2] it was not argued before the Court of Customs and Patent Appeals and was beyond the scope of their decision, because such appeal is statutorily limited to the points set forth by the applicant in the reasons of appeal 35 U.S.C. 142, 144. This Court's review of the decision of the Court of Customs and Patent Appeals is derived from and limited by the latter's jurisdiction. Judicial review of decisions of the Patent Office is granted only to the applicant and is confined to the reasons of appeal.

Also flawed jurisdictionally are the technological fact issues that underlie the computer-program rulings requested by the petition. These issues on the technological nature of computer programs — that every program is (i) but an obvious or "routine" implementation of (ii) a "purpose or idea" (Pet. 10), and (iii) not part of an "actual ma-

1. "Pet." refers to the petition herein.

2. "R." refers to the record below, a copy of which has been forwarded up to this Court.

chine" (Pet. 13) — are not supported by any evidence produced before the Patent Office, and could not be, and were not, raised before the court below, 35 U.S.C. 144, and therefore are not proper issues for review in this Court.

STATUTORY PROVISIONS INVOLVED

35 U.S.C. 141 provides:

> An applicant dissatisfied with the decision of the Board of Appeals may appeal to the United States Court of Customs and Patent Appeals, ...

35 U.S.C. 142 provides:

> When an appeal is taken to the United States Court of Customs and Patent Appeals, the appellant shall give notice thereof to the Commissioner, and shall file in the Patent Office his reasons of appeal, specifically set forth in writing, ...

35 U.S.C. 144 provides:

> The United States Court of Customs and Patent Appeals, on petition, shall hear and determine such appeal on the evidence produced before the Patent Office, and the decision shall be confined to the points set forth in the reasons of appeal. . . .

QUESTION PRESENTED

Under the provisions of the Patent Code relating to appeals, the only question before this Court is:

Whether an automatic record-keeping machine for all types of small-volume users (*e.g.*, merchants, professionals farmers) which enables each to use an individualistic record-keeping format and accounting procedure, and which employs, *inter alia*, a general control for directing the processing operations that are common to most users, which control interacts with and is directed by a master control located in the data files for directing the operations that vary with each user, is unobvious under 35 U.S.C. 103.

STATEMENT OF THE CASE

Respondent's invention as described in his patent application is a "machine system for automatic record-keeping of bank checks and deposits," and is concerned with the use of electronic digital computers for the ordinary financial record-keeping required by small-volume users of all types.

The Machine Problem to Be Solved

The Government and large companies employ electronic computers for processing masses of financial data by performing large numbers of elementary arithmetic operations. Generally, the accounting procedures and ledger formats of such a large-scale user are made to be uniform so that a single special-purpose computer (formed by programming a general-purpose digital computer) can handle all of the data processing — a requisite of efficient use of the large-scale computer facilities. Wide variations in ledger format and in the bookkeeping and accounting procedures used in the ledger summaries were the barriers to efficient use of such computers by low-volume users (*e.g.*, merchants, professionals, farmers).

Respondent recognized that it would be next to impossible to force such small-volume users into a uniform mold of record-keeping so that any single, existing special-purpose computer could be applied to all of them. On the other hand, any single, prior art computer that could handle the wide variations in format among small-volume users would be impractical whether built entirely of circuitry or constructed by programming a general-purpose computer. In addition, any such prior art machine would have the drawback of being unable easily to accommodate users' needs to make changes or corrections in their formats or procedures; nor would it be able to add new users without difficulty. Respondent also recognized that the conventional machine-readable bank checks and deposit slips utilized by merchants, professionals and farmers in their regular business and banking transactions would contain

all the necessary information to perform this record-keeping if a category code were added to them to identify each item within the different classes of a ledger.

The Machine Solution

Respondent devised a single special-purpose computer to do the record-keeping for a variety of users where the prior art would require a different special-purpose computer for each user. This result is achieved with a unique combination of controls, as the court below found (Pet. 5A):

> The control system . . . [comprises] a general control which is applicable to the processing operations that are common to most customers and a master control for the operations that vary on an individual basis with each customer. The general control, as allegedly reduced to practice, is in the form of a software program and the master control is a series of sub-files, one for each customer, which are in the form of a sequence of records containing suitable control mechanisms and the customer's financial data.

The general controls include those controls that direct various totalizing operations in accordance with the master controls established individually by the user himself and set up in each user's master sub-files, which also contain the user's data. With the mechanisms of this construction, any record-keeping format can be handled, and all of the control variations that exist among users are set up in the master files and can be readily changed or added to as though they were data. The single set of general controls (which unlike data cannot be readily modified) interacts with, and is effectively a slave to, all of the master controls for each customer. The slave or general controls direct the performance of all of the record-keeping in the customer's own format and bookkeeping or accounting procedure under the direction of the master controls. Thus, each user is supplied with his own individualized printed ledger report. Changes in controls for modifying the format or pro-

cedure for any small user can be achieved about as easily as an error in an amount can be corrected, and new users can be similarly added to the system without changes or additions to the general controls. Thus, once designed and constructed, the general controls do not have to be reconstructed to accommodate customary changes in user requirements.

Respondent's special-purpose computer is also disclosed (R. 93, 94) for construction entirely by equivalent wired computer circuitry known to those skilled in the art, which version is a more costly one given the present state of the computer art and therefore not preferred.

The patent claims approved by the Court of Customs and Patent Appeals decision are directed to respondent's machine construction employing the aforementioned two-part control mechanism; and all the claims specify the different locations of the two controls: one in the master files so that they can be easily changed (*e.g.*, if the user's bookkeeping format changes) and the other as the general controls that remain unchanged for all users. The claims *per se* do not raise any issue of computer programs; they do not call for the use of a computer program in the construction of respondent's special-purpose computer, and they apply also to the wired computer-circuitry version.

Only machine claims were in the patent application as originally filed. These machine claims were rejected by the examiner as improper in form, and process claims were required by the examiner instead by reason of the use of a computer program, which he held was a "new use of an old machine." This new-use/old-machine rejection was reversed by the Board of Appeals, since it was predicated on a false understanding of the technological facts of computers and computer programs, as the Board held (Pet. 28A):

> . . . an unprogrammed, or a differently programmed, general purpose computer is [not] the same machine as the one that would result from appel-

lant's programming of the same or of a similar computer.

That is, a program inserted in a general-purpose computer creates a new machine that incorporates, as one part, the machine of the general-purpose computer and as another part, the computer program, which interconnects the parts of the general-purpose computer into a certain configuration with a particular combination of controls determined by the program. In short, "the program restructures the computer," Flores, "Computer Software," *infra*.

Thereafter, on appeal to the Court of Customs and Patent Appeals, the process claims were dropped and original machine claims were retained, for respondent did not believe process claims defined the invention, which has as its nub the control mechanism formed as a combination of two specific parts and a specific location and interrelation of those parts. This control mechanism, respondent has always asserted, is part of a machine rather than a process.

The court below also concluded that none of the prior art was concerned with the machine problem and none disclosed the machine solution embodied in respondent's invention (Pet. 15A, 16A); for with respondent's single machine, the record-keeping for all of the multitude and variety of users can be performed in a practical way, while with the prior art a *different* machine would be required for each user having a different ledger format or a different bookkeeping procedure.

ARGUMENT

All of the issues underlying the questions formulated in the petition are issues of the technological facts of computers and computer programs, issues of fact on which there is no conflict between the two tribunals below, or issues which were not raised below. In both cases there is no evidence developed in the record on which the Court can reach the requested decision. Under these circumstances, this Court has ruled, *Graver Tank & Mfg. Co. v. Linde Air Products*, 336 U.S. 271, 275 (1949):

> A court of law, such as this Court is, rather than a court for correction of errors in fact finding, cannot undertake to review concurrent findings of fact by two courts below in the absence of a very obvious and exceptional showing of error. [citations omitted]

The petition does not support the allegations of error by any evidence identified in the record, or otherwise tendered, so that this case is not an appropriate one for the Court to exercise jurisdiction under 28 U.S.C. 1256.

There are no important questions of law that are unresolved, for the legal principles applied by the court below are well established: the doctrine, last enunciated by the Court in *Gottschalk v. Benson*, 409 U.S. 63 (1972), that "ideas" are not patentable, and the fundamental patent rule that: "A machine is not a principle or an idea," crisply set down by the Court in *Burr v. Duryee*, 68 U.S. 531, 570 (1864), following the Court's similar ruling in *O'Reilly v. Morse*, 15 How. (56 U.S.) 62 (1853); see also *Mackay Radio v. Radio Corporation of America*, 306 U.S. 86 (1939); *The Telephone Cases*, 126 U.S. 1 (1888). The *Burr* and *Morse* rule that a patent to a machine does not cover a process or an "idea," which was followed by the court below, is consistent with *Benson*, which was concerned with a process, and a mathematical process at that. Applying these rules and recognizing that computer programs restructure computers into different machines, the Court in *Benson* clearly

stated, in response to petitioner's request to hold all computer programs unpatentable, "We do not so hold," (at 71).

The technological issues of fact that the petition asks the Court to deal with are: every computer program is (i) a "routine" or obvious implementation (Pet. 10) of (ii) an "idea or purpose" (Pet. 10), and (iii) is not part of any "actual machine" (Pet. 13), from which petitioner argues it is only a "new use of an old machine" (Pet. 15). These factual issues are set up by the petition, in a procrustean attempt to cut and stretch all machines constructed by programs (as well as the machine of this case) into a *Benson* fact situation, notwithstanding that there is no evidence in the record that all computer programs are (i) "routine," or obvious, nor evidence that programs are only directed to (ii) "ideas"; and notwithstanding that the issue that a computer program is (iii) not part of an "actual machine" is contradicted by long-standing decisions of both tribunals below, see Section II, *infra*, reiterated by the Board in this case. The Board (as quoted above) held that the controls produced by the computer program are a part of the *different* machine produced by that program;[3] and the Board also reversed the examiner's holding that a computer program is a new "use of a known machine" (Pet. 28A).

The petition's factual issues fly in the face of all technological, as well as legal, authority (see Section II, *infra*) and are palpably unfounded. Computer programs exist to convert a general-purpose computer to, *inter alia*, a musical synthesizer (see Appendix herein),[4] a talking computer, or a document reading computer, all of which are plainly

3. A similar statement was made by Justice White at the oral argument of *Benson*, Transcript of Oral Argument at 17.

4. One such musical synthesizer receives punch card records of the musical notes to make a recording or play the corresponding music. In the musical synthesizer shown in the Appendix the computer program provides additional structure for the illustrated general-purpose computer so that the input to the computer is in the form of printed music notation such as would appear in sheet music, from which the programmed machine generates the output for reproducing the corresponding music. A composer can write his music and have it played back immediately.

machines and not "ideas," and certainly each is not a "routine" or obvious development but rather "synergistic." The program in each of these examples establishes the interconnections and vital control mechanisms that determine the structural form of the machine. These examples illustrate that not only have unobvious machines built with computer programs been invented in the past, but that there remain many unsolved machine problems on the horizon, and their solution may be provided by a programmed computer.

Such machines, formed as a combination of known devices (including an existing general-purpose computer), are patentable as machines notwithstanding that one or more of the devices (including the existing computer) are themselves patented, *Cantrell v. Wallick*, 117 U.S. 689, 694 (1886).

The court below concluded from the technological facts of respondent's invention that the claimed machine *is not* merely a "routine," or obvious implementation and *is* a machine *not* an "idea." The review here requested, not only of the claimed machine but of all machines produced with computer programs, would not be appropriate, for this Court would not have the basis for reaching the conclusion that all computer programs are unpatentable. No general rule negating patentability of all programmed computers can be established from the machine example in this case (any more than it could be in *Benson*, from the singular example of that mathematical process). On the other hand, it is manifest from the above examples and many others that not all computer programs suffer from the foregoing alleged factual disabilities. Therefore, even under petitioner's procrustean argument, the Government does not have any rational basis to arrive at a universal rule that machines built by programmed computers are not patentable. That universal rule was rejected in *Benson* ("We do not so hold," at p. 71); for the petitioner's arguments would "certainly . . . reduce programs to a nothing." (Tr. *Benson*, 18).[5] For the same reasons, this peti-

5. "Tr. *Benson*" refers to the transcript of oral argument in that case.

tion's request for such a sweeping rule would have to be rejected here.

Lacking any evidence to support a general rule of nonpatentability of all computer programs, and in light of strong evidence to the contrary, it is inappropriate to use this case as a vehicle for the promulgation of such a general rule. The petition offers no other reason to justify review of the Court of Customs and Patent Appeals' application of well-developed law to the particular facts of respondent's invention which resulted in finding it patentable.

In the manner of an afterthought the petition also asks the Court to review, along with the other questions, the holding of the court below that respondent's machine is unobvious under 35 U.S.C. 103 in view of the prior art, while conceding that the unobviousness question is not an appropriate matter for the Court's review (Pet. 17, n. 10). But respondent's combination of control mechanisms is unobvious, because it is "synergistic," that is of "an effect greater than the sum of the several effects taken separately." See *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 61 (1969). The invention is a single practical special-purpose computer, while the prior art's impractical alternative would require many special-purpose computers, each inflexibly set to a user's particular format and procedure.

Petitioner cannot successfully contest the patentability of the claimed machine on its merits; so petitioner seeks to negative patentability by the type of computer architecture (namely, a computer program) which was used to construct the preferred embodiment. This violates the clear proscription of 35 U.S.C. 103 that: "Patentability shall not be negatived by the manner in which the invention was made." The review requested manifestly seeks to accomplish precisely that which is proscribed.

The dissents in the Court of Customs and Patent Appeals did not disagree on these factual questions of computer technology. Judge Rich's opinion in this case, though termed a dissent, is more of a statement of disagreement with this Court's decision in *Benson*; an expression of

support for the C.C.P.A's decision by reaffirming his own opinion in *Benson*, and his formulation of a position to compel the Patent Office to seek *certiorari* in this *Johnston* case for a reargument of *Benson*, as he explained in a recent article:[6]

> I do not see how the Patent Office can avoid at least trying to get certiorari granted in *Johnston*, as I implied in my dissenting opinion, in which, by the way, I do not abandon my personal beliefs about what § 101 means, as expressed in the CCPA *Benson* opinion, ...

While Judge Rich is highly complimentary in suggesting this *Johnston* case as a vehicle before this Court to reargue *Benson*, *Johnston* has substantially different issues from those of *Benson*, and cannot, any more than *Benson*, afford a record for a resolution of the technological questions so as to reach the rule requested by the petition that all computer programs are unpatentable.[7]

The decision below can be extremely important in encouraging competition in the computer-program (software) part of the computer industry (the most important part, since programs are the *sine qua non* of computers), and Judge Rich's opinion contains a strong reminder of the competitive implications.[8] This same view is expressed by

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6. Giles Sutherland Rich, "Change" 2 *APLA Quarterly Journal* 214, at 226 (American Patent Law Association, Fall 1974).

7. Chief Judge Markey's opinion below dissents on the question of unobviousness, but does not express any change from his consistent support of the long line of the Court of Customs and Patent Appeals decisions on the technological findings that underlie the patentability of computing machines built by means of a programmed general-purpose computer (quoted *infra*). See *In re Comstock*, 481 F.2d 905, 909 (1973); *In re Knoulton*, 481 F.2d 1359, 1368 (1973).

8. J. Rich's opinion states: "I find it . . . significant to contemplate the identities of the troops lined up for battle in *Benson* and observe which side obtained the victory. On the one side was the Government, against patenting programs or software, supported by the collective forces of major hardware (i.e., computer) manufacturers and their representative associations who, for

the computer industry itself in a report by *Datamation*, a leading monthly computer trade journal, March, 1975, pp. 18, 128 that stated the *Johnston* decision, which deals with a "machine system" (unlike *Benson* which dealt with a "mathematical process") will "spur the growth of the independent software business." Certainly, respondent and other small software businesses are entitled to the same patent protection for its machine inventions as that provided by "IBM's patents" (Pet. 15) granted for IBM's machines.

The Court of Customs and Patent Appeals has been proceeding in the traditional fashion on a case-by-case basis to determine which of this technology would be patented and which would not. Case-by-case supervision by this Court as called for by the petition is inappropriate.

I. None of the objections found by the Court to a patent for the mathematical process in *Benson* apply in this case. Unlike *Benson*, at 64, the claims herein are limited to a "particular art and technology" (that of automatic record-keeping) and to a "particular apparatus and machinery" (that of the special-purpose computer constructed to have the specific two-part control mechanism). The claims herein (unlike *Benson*, at 67) are not directed to mathematics, nor to a process, mathematical or otherwise, but are limited to apparatus and to presently existing machinery, see Section II, *infra*. Moreover, there are no "ideas," neither mathematical nor any other abstract ideas, that underlie respondent's machine, and a patent to that machine would (unlike *Benson*, at 71-72) not preempt any "ideas" nor any mathematical formulas or algorithms, see Section III, *infra*. Respondent's apparatus performs only machine functions, for there is "not a

Note 8—*Continued*

economic reasons, did not want patents granted *on programs* for their machines. On the other side was Benson et al. and their assignee and assorted lawyers and legal groups who were in favor of patent protection for programs or software.

human being inside or outside" (Court of Customs and Patent Appeals below, Pet. 13A), and as this Court has held: "A machine is not a principle or an idea," nor can a patent limited to one form of machine cover the process it has in common with other forms of machines (*Burr*, at 570).

The petition (p. 13) quotes *Benson* out of context and argues that *Benson* (at 71-72) set the test that if a machine "has no substantial practical application except in connection with a digital computer" it is not patentable. Whatever that quote may mean in the context of *Benson*, certainly the Court did not conclude that effectively all digital computer technology is unpatentable, which is what the petition finds it must argue in order to contest the patentability of respondent's special-purpose computer. Nor did *Benson* (at p. 70) "preclude a patent for any program servicing a computer." The Court emphatically said: "We do not so hold," The Court in *Benson* rejected any such ruling that would "reduce programs to a nothing . . ." (Tr. *Benson*, at 18). As the Court's rejection of that ruling in *Benson* came after an exhaustive presentation of the technological issues, there would be no point to a reargument of *Benson* in this case.

II. The petition's argument that respondent's invention is a "new use of an old machine," not properly before this Court (see the Jurisdictional Statement), in essence asks this Court to decide the issue of technological fact of whether the programming of a general-purpose digital computer results in a special-purpose computer different from the general-purpose machine. The petition asks this Court to answer that question in the negative notwithstanding that 1) there is absolutely no evidence adduced on the issue in the record or in the petition, 2) all expert evidence is to the contrary, and 3) the issue was resolved in respondent's favor by both tribunals below and is in fact the subject of a well-considered line of cases in the Court of Customs and Patent Appeals.

One of the first clear findings on the technological nature of computer programs was published as a notice of the Commissioner of Patents in 1966, *"Guidelines to Examination of Programs,"* 829 O.G. 441, 442 by order of Edward J. Brenner, Commissioner of Patents, July 6, 1966, as follows:[9]

> A machine which has as a part thereof a program device to cause the entire combination to carry out machine functions is embraced within the patent statute the same as any other special purpose machine and the fact that portions of the complete machine take the form of a replaceable program device is of no moment.[10]

The Court of Customs and Patent Appeals found this same fact, *In re Prater*, 415 F.2d 1393, n. 29 (1969), as follows:

> . . . a general purpose computer may be regarded as but a storeroom of parts and/or electrical components. But once a program has been introduced, the general-purpose digital computer becomes a special-purpose digital computer (i.e., a specific electrical circuit. . . .

and again, *In re Bernhart* 417 F.2d 1395 (1969), as follows:

> [W]e say that if a machine is programmed in a certain new and unobvious way, it is physically different from the machine without that program; its memory elements are differently arranged. The fact that these physical changes are invisible to the eye should not tempt us to conclude that the machine has not been changed.

These findings have been followed since *Benson* in all of the most recent Court of Customs and Patent Appeals cases as follows (*Knowlton, supra*):

> . . . when appellant's program is fully loaded into the computer the stored pattern of signals transforms the unprogramed machine into a new structure, with all the necessary hardware elements being physically interrelated so as to enable them to perform their specified functions. [See also *Comstock, supra.*]

These findings of fact are based on and supported by the computer scientists themselves, who have day-to-day first-hand knowledge of the computer structure and its operation (Professor Ivan Flores, City University of New York, "Computer Software," *Science & Technology*, No. 89, May 1969, pp. 16, 17);

> . . . another feature distinguishing the computer from other mechanisms is its restructurability . . . The program directs the computer; changing the program restructures the computer.

A technical paper by the Director of the Computer Center of Purdue University[11] explains the interrelation-

9. This Guideline states unequivocally that respondent's machine is patentable, if unobvious. Commissioner Brenner subsequently explained in 1968 that these 1966 guidelines would not be followed, because the Patent Office sought "a strong deterrent to the filing of patent applications" apparently because it was concerned that it would be faced with an administrative inconvenience in examining such applications; *see* Brenner, *"The Future of Computer Programs in the U.S. Patent Office,"* at B-12.

10. The Guidelines further stated: "A programable machine, such as a general purpose computer, with its various parts not interconnected to perform any useful combined operation is merely a "warehouse" of unrelated parts. It may well be that the same machine, with a program device correctly related thereto, may yield a novel and useful machine combination due to the new interrelation of parts. In other words, the fact that such a prior art machine can have its parts interrelated by a program device in a new way to carry out machine functions of a specialized character may well result in a new patentable combination, unless there is a prior art teaching that would make the interrelations and results thereof obvious."

11. Prof. Saul Rosen, "Hardware Design Reflecting Software Requirements," 33 *Proc. Fall Joint Computer Conference*, 1968, Pt. II, pp. 1443, 1444.

ship and engineering equivalence of computer programs (software) and the computer circuitry (hardware) out of which the general-purpose computer is built, as follows: "much of the sequencing that is done by hardware is the same kind of thing that is done in [software] programming." The paper uses "the term *hardware programming* to indicate programming built into hardware, either through a microprogramming system or by other hardware sequencing methods" (emphasis ours). It uses another term, "extended machine" to characterize the "combined hardware and software system" that is produced when a general-purpose computer is operated under the control of a software program.

This paper[12] and others confirm the well established technological ". . . principle of the equivalence of programming and hardware. This principle begins to invade our consciousness when we recognize that a program for a general-purpose machine turns it into a special-purpose machine."[13]

Thus, the addition of a software program to control a general-purpose computer (thereby creating the "ex-

12. Ibid. at p. 1443: "Perhaps the most important part of the job of computer system design is to determine which functions are best handled by hardware, and which should be provided by software. All of the traditional engineering considerations come into play here. One must consider the added cost of additional hardware measured against possible gains in operating efficiency. One must consider the availability of manpower with the appropriate skills for design and for implementation. One must also consider intangible factors such as the inherent advantages of simplicity and the hidden costs of complexity.

"From the point of view of the computer user it makes no difference which features are incorporated into the hardware and which are programmed in software.

"It is the combined hardware-software system, the 'extended machine' that the user must rely on to provide the power and flexibility and convenience that have been promised with each new generation of computing equipment."

13. Prof. Saul Gorn, Final Report No. AD 59 URI, at p. 4, from Univ. of Penna. Moore School of Elec. Eng. to U.S. Army Signal Research & Development Labs, 1959.

tended machine") is just as much a machine addition to the general-purpose computer as is the additional hardware programming that may be used to enlarge or enhance the character of an existing hardware computer. In both cases, the addition of programming results in a machine system which is different from the machine without the additional programming.

III. The work stuff of a computer—the data, numbers, records—are abstract ideas; but the control mechanisms of the computer are concrete and determine the unique character of a special-purpose computer. This invention solves a machine problem and provides a concrete machine solution with a unique combination of interrelated control mechanisms which produces a concrete and novel special-purpose computer for processing the abstract ideas embodied in financial records. The claims herein cover the machine structured by a combination of control mechanisms and not the underlying process, which process of record-keeping is available to all to perform by any other machine construction, as this Court said (*Burr*, at p. 570):

> A machine is a concrete thing; consisting of parts, or of certain devices and combination of devices. The principle of a machine is properly defined to be . . . that peculiar combination of devices which distinguishes it from other machines. A machine is not a principle or an idea.

The court below was mindful of the doctrine that an abstract idea is not patentable subject matter in holding (without dissent on this issue) that this invention was not an abstract idea, nor would any monopoly be granted, directly or indirectly, for a business scheme (Pet. 14A):

> The appealed apparatus claims are not drawn to cover either a method of doing business or even a method of bookkeeping. Nor would banks "be restricted to the use of their data processing equipment only for their own bookkeeping and not . . . [be] allowed to freely expand into the business of keeping books for their

customers." Obviously, banks would be free to so expand their services and use any apparatus they may desire *except* the apparatus set forth in appellant's claims.

IV. The court below, in reversing the Board on the issue of unobviousness, found that the prior art computers considered by the Board (the system proposed by the Board and the system of the Dirks patent) are not concerned with the same problem as that of respondent's invention, namely, that of providing an automatic machine able to handle all of the different record-keeping of a large number of small-volume users in different formats and with different bookkeeping systems. Neither prior art system is even "suggestive of the subject matter of the . . . claims" (C.C.P.A. below, Pet. 16A), and neither suggests the specific combination of control mechanisms that is the nub of the claimed invention. To the contrary, the machine disclosed in the prior art Dirks patent and the system proposed by the Board are the type designed for a single large-volume user and would be impractical to deal with the machine problem of this invention.

The court below followed this Court's directive in *Graham v. John Deere Co.*, 383 U.S. 1, 6 (1966), and this Court's supervision of the Court of Customs and Patent Appeals' analysis of these technological details is not required in this case, and the petition so concedes (Pet. 17, n. 10).

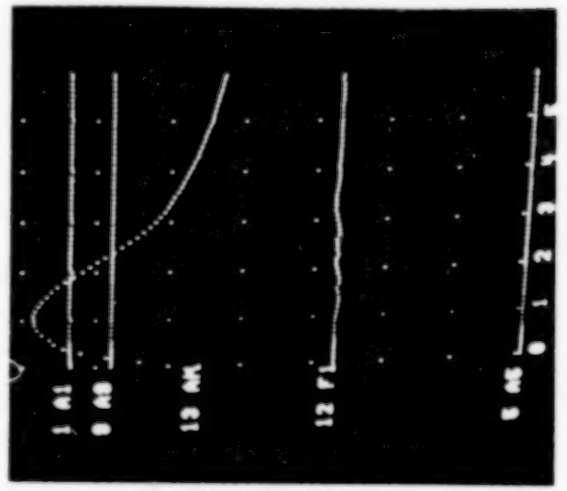
CONCLUSION

For the above reasons, the petition should be denied.

Respectfully submitted,

MORTON C. JACOBS
Attorney for Respondent

TECHNOLOGY REVIEW, MASSACHUSETTS INSTITUTE OF TECHNOLOGY VOL. 72, pp. 18, 19, MAY 1970.



M.I.T.'s Walter D. Bilofsky uses a PDP-9 computer adapted for sound synthesis and analysis. He is shown using a program, of his own design, for the construction of a musical score, which the computer plays using sounds designed with the help of a second, sound-specification, program. At right is the visual output of this program, which enables the composer to edit the characteristics of his chosen sound. (Photos: Don Estes)

La Machine Infernale

Music by Computers
Heinz Von Foerster, James W. Beauchamp, editors
New York, John Wiley & Sons, Inc.,
139 pp., $14.95

Reviewed by
Stephen W. Smoliar
Department of Mathematics, M.I.T.

This book is a collection of papers and sample recordings presented at the 1966 Fall Joint Computer Conference in a session entitled "Computers in Music" organized by Heinz Von Foerster.

No. 74-1033

Supreme Court
FILED
MAY

In the Supreme Court of the United States

OCTOBER TERM, 1974

C. MARSHALL DANN, COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

THOMAS R. JOHNSTON

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

REPLY BRIEF FOR PETITIONER

ROBERT H. BORK,
Solicitor General,
Department of Justice,
Washington, D.C. 20530.

JOSEPH F. NAKAMURA,
Solicitor,
United States Patent and Trademark Office,
Washington, D.C. 20231.

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REPLY BRIEF FOR PETITIONER

Respondent does not dispute that the issues in this case are important (Br. in Opp. 11-12) or that there is a conflict in the rationales of the decision below and of the decision in *Gottschalk* v. *Benson*, 409 U.S. 63, that warrants resolution by this Court. Rather, respondent contends that this Court "is without jurisdiction" (Br. in Opp. 1) to review one or two[1] of the three questions presented.[2] That contention, however, rests in part upon a misunderstanding of our position on the merits and is in any event without merit.

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[1]Although respondent apparently includes within his jurisdictional attack the first question presented (*i.e.*, whether *Benson* may be circumvented by claiming a programmed computer as a "machine system" instead of claiming the programming idea as a "process"), his contentions are directed almost entirely to the second, and broader, question (*i.e.*, whether programs for existing computers are patentable however claimed).

[2]Respondent concedes that the third question presented (*i.e.*, whether his programming idea was "obvious") is properly before the Court (Br. in Opp. 2).

1. Respondent's comments concerning the merits of our position reflect a serious misapprehension. We do not contend that "every computer program" necessarily can and must be fit into a "procrustean" mold concerning the extent of inventiveness underlying the basic idea in question and the program to implement it through a computer (Br. in Opp. 8-9). To the contrary, we recognize the possibility of patentability if a program co-acts with an ordinary computer in a "synergistic" way, if the program is carried out with newly-invented apparatus, or if a program produces a new use for an old machine sufficiently inventive to be patentable as a process (Pet. 14-15). Respondent's claimed invention, like a wide variety of computer programming ideas (but perhaps unlike some of the examples cited by respondent (Br. in Opp. 8-9)), satisfies none of these requirements.

2. This Court plainly has jurisdiction under 28 U.S.C. 1256 to review the judgment of the Court of Customs and Patent Appeals in this case. "[B]y using broad and unqualified language [in Section 1256], Congress intended [this Court's] certiorari jurisdiction over CCPA cases to be as broad as the Constitution permits." *Brenner* v. *Manson*, 383 U.S. 519, 527.

Respondent asserts, nevertheless, that the Commissioner of Patents is "jurisdictionally" barred from challenging in this Court the rationale of the decision of the Court of Customs and Patent Appeals. That is so, respondent claims, because the Commissioner did not (and could not) appeal to that court a statement in the opinion of the Patent Office Board of Appeals (in rejecting respondent's application on grounds other than those on which the patent examiner relied[3]) which respondent regards as having rejected the

[3]The Board regarded as invalid the examiner's apparent premise that even with a different program a general purpose computer "is the same machine" (Pet. App. 28A).

Commissioner's position in this Court (Br. in Opp. 2), and because respondent's "reasons of appeal" (see 35 U.S.C. 142, 144) to the Court of Customs and Patent Appeals did not comprehend the grounds for rejection asserted by the Commissioner in this Court.

Even if the latter proposition (which we dispute[4]) were accepted, it would not affect the propriety of this Court's consideration of any of the questions presented. Where the examiner rejects a patent application on one ground and the Board of Appeals does so on a different ground, if (as here) the judgment of the Court of Customs and Patent Appeals reversing the Board's ruling also constitutes in effect a reversal of the examiner's ruling, then surely the rationale of the examiner's ruling may be considered by this Court on certiorari. Else this Court would be obliged to review judgments of that court in an artificial and unrealistic manner unlike the way it reviews the judgments of other courts. That the Commissioner was limited in the court below by statute (35 U.S.C. 141, 142, 144) in challenging the rationales or the results of decisions of the examiner and the Board in denying respondent's application, does not limit the authority of this Court under 28

[4]The 45 assignments of error in respondent's notice of appeal (see App., *infra*), which challenged virtually every aspect of the Board's decision, may fairly be read as bringing before the Court of Customs and Patent Appeals the questions presented in the petition concerning the patentability *vel non* of computer programs, whether as processes or machine systems. For example, respondent asserted that the Board had erred in applying the lower court's own decision in *Benson* (not yet reversed by this Court); in determining that his claims did not involve patentable subject matter; in concluding that his claims did not concern a particular apparatus or enhancement of its functioning; and in holding that there was no difference in substance between his "machine system" and "process" claims, which must stand or fall together (App., *infra*, pp. 7-9).

U.S.C. 1256 to review the entire case. Cf. *Brenner* v. *Manson, supra*, 383 U.S. at 523, n. 6.[5]

In any event, even if in other circumstances the effect of the Patent Code provisions cited by respondent might be to limit this Court's scope of review, they should not be given that effect in this case because of the intervening decision of this Court in *Benson*, after respondent had delineated his reasons of appeal. In reversing the lower court's judgment in *Benson*, this Court effectively undermined the basis of respondent's appeal in this case. Under settled principles, the court below would have been bound to apply *Benson* even if the principles it established had not been implicated by respondent's reasons of appeal. Cf. *Bradley* v. *Richmond School Board*, 416 U.S. 696, 711-721; *Thorpe* v. *Housing Authority*, 393 U.S. 268, 281. Accordingly, the court below was obliged to apply *Benson* (and it professed to do so) and the Commissioner is free to challenge in this Court the correctness of its judgment in doing so.

For the reasons stated in the petition and in this reply brief, it is respectfully submitted that the petition for a writ of certiorari should be granted.

ROBERT H. BORK,
Solicitor General.

JOSEPH F. NAKAMURA,
Solicitor,
United States Patent and
Trademark Office.

MAY 1975.

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[5]Had respondent exercised his option to seek review of the denial of his application in the District Court for the District of Columbia (35 U.S.C. 145), rather than in the court below, it is clear that the scope of review in neither the district court nor this Court would be subject to the limitations urged by respondent. It would be "anomalous" and "strange indeed" if the scope of this Court's review were limited "where the alternative route was elected." *Brenner* v. *Manson, supra*, 383 U.S. at 527.

APPENDIX

Patent Appeal No. 9088

NOTICE OF APPEAL TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS, DECEMBER 28, 1971.

Hon. Commissioner of Patents
Washington, D.C. 20231

Sir:

Appellant hereby gives notice of his appeal to the United States Court of Customs and Patent Appeals from the decision of the Board of Appeals rendered on or about October 27, 1971, which decision reversed each of the rejections (which were based on 35 U.S.C. 101, 102 and 112) advanced by the Patent Examiner below and entered new rejections of claims 1 through 11 and 16 through 27, inclusive.

The following are assigned as reasons of appeal:

1. The Board of Appeals erred in failing to allow claims 1 through 11 and 16 through 27 and in entering new rejections of those claims.

2. The Board erred in its summary statement of appellant's invention by omitting important features thereof.

3. The Board erred in holding that the details of the disclosed machine-readable program for a computer "are not brought into issue in this appeal by reason of the character of the claims presented."

4. The Board erred in holding that the claims are "either to a method of bookkeeping . . . or to apparatus that automatically carries out . . . the steps of the bookkeeping method."

5. The Board erred in holding that all of the aforementioned claims fail "to point out and distinctly claim that which appellant considers to be his invention" and therefore that the claims fail to meet the requirements of 35 U.S.C. 112, second paragraph.

6. The Board erred in holding that appellant did not consider his invention to be the use of a form of automatic data processing "for the financial record-keeping and statement-furnishing operations of a bank."

7. The Board erred in holding that "the appealed claims, both apparatus and method [are] not directed to improved record keeping machinery, but rather to a broad system of keeping financial records."

8. The Board erred in holding "the distinction over acknowledged prior record-keeping is either in the identity of the person or institution which has custody of certain phases of the bookkeeping operation or in the financial meaning of or the relationship existing between, the various records."

9. The Board erred in holding that there is "broad sweeping reference in the claims to the automation of the banking industry," and that such reference "serves only as a dress for claims that spell out, in effect, the relationship of a bank and its customers, not any particular configuration of business machinery."

10. The Board erred in holding that the claims are indefinite under 35 U.S.C. 112, second paragraph, for "failing to distinctly point out the invention."

11. The Board erred in holding that the claims on appeal, "both method and apparatus, purport to identify record storing portions of the apparatus or method steps, only by the particular financial meaning to be accorded this data."

12. The Board erred in holding that the meaning to be accorded data "in no way can define either the construction of the data storing apparatus or the machine processing steps thereof."

13. The Board erred in holding that "there can be no structural or operational relationship of a computer memory with the meaning one chooses to assign outside the computer to a particular configuration of binary digits or 'bits' in its memory."

14. The Board erred in holding that "although a group of such bits is processed as an alphanumeric character within the computer this results from the physical states of the memory cells and manifestly this is unrelated to whether a series of such characters represents a stock number of a part or a sum of money, outside the computer."

15. The Board erred in holding that "the only identification of the meaning represented by a section of the computer memory is in the mind of the user and cannot define any characteristic of the apparatus."

16. The Board erred in suggesting that appellant "chooses to denominate a section of its memory by a term descriptive of one meaning, such as a file of stock numbers rather than a file of sums of money."

17. The Board erred in holding that all the claims are indefinite under 35 U.S.C. 112.

18. The Board erred in holding that the claims on appeal embrace, in apparatus claims or as a part of the apparatus steps of method claims, that which has been "held to be outside the scope of apparatus."

19. The Board erred in holding that the claims are "for subject matter outside the patent statutes" and therefore unpatentable under 35 U.S.C. 101.

20. The Board erred in holding that "those systems which do extend beyond the field of technology are not within the 'technological arts' and are non-statutory" and in failing to recognize that any constitutional limitation under 35 U.S.C. 101 is to the "useful arts."

21. The Board erred in holding that the *Benson et al.* decision (169 U.S.P.Q. 548) was a ruling by the C.C.P.A. "that 'liberal arts' are to be exluded from the 'useful arts' and, hence, innovations directed thereto are non-statutory."

22. The Board erred in failing to follow the ruling in *Benson et al.* that "all other types of business machines" are in the "technological arts."

23. The Board erred in holding that appellant's invention reflects "no concern for the enhancement of the internal functioning of the machine."

24. The Board erred in failing to recognize that the invention of this application falls within the Board's definition of improvements in machines "that replace manual effort" and is therefore within the "technological arts."

25. The Board erred in holding that appellant's invention is outside of the "technological arts."

26. The Board erred in holding that "the claims on appeal simply specify that the bank will perform the bookkeeping and accounting services for its customers, rather than each customer performing his own."

27. The Board erred in holding that each data file in the appealed claims "is identified only as to its role in the bookkeeping and accounting system, in association with 'means' for performing conventional bookkeeping and accounting operations on the data files."

28. The Board erred in holding that the recitation of the claims "is without regard to the particular apparatus used to perform these operations and certainly with no 'enhancement' of the machine operation spelled out."

29. The Board erred in holding that there is "no essential difference in substance between the apparatus and process claims" and that they "must stand or fall together."

30. The Board erred in holding that the claims on appeal "would, in effect, grant a monopoly to appellant on a method of conducting the banking business."

31. The Board erred in holding that "banks would [by these claims] be restricted to the use of their data processing equipment only for their own bookkeeping and not being allowed to freely expand into the business of keeping books for their customers."

32. The Board erred in holding that the grant of these claims "would allow the intrusion of the patent sytem into the social sciences already under regulation by governmental agencies" and it "would exceed the constitutional grant of authority to issue patents in the 'technological arts'."

33. The Board erred in holding that the claims are unpatentable under 35 U.S.C. 103.

34. The Board erred in holding that the claims are "for obvious variations of . . .the system of bookkeeping by banks that was acknowledged to be old by appellant on page 2 of the specification."

35. The Board erred in holding that the claims are "for obvious variations of . . . the system of bookkeeping of the Dirks patent [U.S. 3,343,133] when applied to banking rather than industrial business."

36. The Board erred in holding that terms such as "special," "trust," "escrow," "personal" and the like are each "a category code as called for by the appealed claims" and that the bank's treatment of such accounts "is no different than appellant accords the different category codes."

37. The Board erred in holding that appellant "merely adds the category number to the end of the account number to create, in effect, a series of different and distinct account numbers to be used during most of the data processing."

38. The Board erred in suggesting that appellant's invention is concerned with enabling banks to provide their customers "with a form of cost accounting facilities."

39. The Board erred in suggesting that appellant's invention is "merely printing the summary sheets for all the special accounts of an individual on a single document with totals for all accounts" and in holding that it "would be an obvious convenience to both the bank and the customer."

40. The Board erred in holding that the Dirks patent discloses a system in which "each area is assigned an account number in which transaction and balance files are kept and updated (column 9, lines 21-26)."

41. The Board erred in viewing the apparatus and method covered by the claims as a "bookkeeping apparatus and method" and in holding that it would be "obvious to a person of ordinary skill to use the cost accounting portion of the Dirks system of bookkeeping in the banking . . . business," and in suggesting that use would anticipate the claimed invention.

42. The Board erred in failing to construe appellant's claims in the light of appellant's disclosure, as required by 35 U.S.C. 112, last paragraph.

43. The Board erred in failing to interpret the claims "to cover the corresponding structure, material or acts described in the specification or equivalents thereof" as specified by 35 U.S.C. 112, last paragraph.

44. The Board erred in disregarding the contribution to the art provided by appellant's invention and in holding it would be outside the patent laws as unpatentable subject matter.

45. The Board erred in not distinguishing between the claims of different scope and different subject matter and in holding all of them unpatentable for the same reasons as applied to the broadest claims.

Respectfully submitted,

/s/ Morton C. Jacobs

Morton C. Jacobs

December 23, 1971

Supreme Court, U. S.
FILED
JUL 31 1975
MICHAEL RODAK, JR., CLERK

No. 74-1033

In the Supreme Court of the United States

OCTOBER TERM, 1975

C. MARSHALL DANN, COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

THOMAS R. JOHNSTON

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE PETITIONER

ROBERT H. BORK,
Solicitor General,
THOMAS E. KAUPER,
Assistant Attorney General,
GERALD P. NORTON,
Assistant to the Solicitor General,
HOWARD E. SHAPIRO,
RICHARD H. STERN,
Attorneys,
Department of Justice,
Washington, D.C. 20530.

KARL E. BAKKE,
General Counsel,
Department of Commerce,
Washington, D.C. 20230.
JOSEPH F. NAKAMURA,
Solicitor,
JERE W. SEARS,
Deputy Solicitor,
United States Patent and
Trademark Office,
Washington, D.C. 20231.

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v.

THOMAS R. JOHNSTON

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

BRIEF FOR THE PETITIONER

OPINIONS BELOW

The opinion of the Court of Customs and Patent Appeals (Pet. App. 1A–22A) is reported at 502 F. 2d 765. The opinion of the Patent Office Board of Appeals (Pet. App. 25A–36A) is not reported.

JURISDICTION

The judgment of the Court of Customs and Patent Appeals (Pet. App. 23A) was entered on October 11, 1974. On December 12, 1974, the Chief Justice extended the time for filing a petition for a writ of certiorari to February 16, 1975 (a Sunday). The petition

was filed on February 18, 1975 (February 17 having been a legal holiday), and was granted on May 12, 1975. The jurisdiction of this Court rests on 28 U.S.C. 1256.

QUESTIONS PRESENTED

1. Whether this Court's holding in *Gottschalk* v. *Benson,* 409 U.S. 63, that a new idea to be implemented by programming an existing computer is unpatentable when claimed as a new "process," also applies when the programmed computer is claimed as a new "machine system."

2. Whether programs for existing general purpose digital computers, however claimed, are patentable under present law.

3. Whether respondent's idea of having banks provide an additional bookkeeping service by programming their computers to sort check and deposit data in accordance with category codes was in any event no more than an obvious improvement over prior art.

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

Article I, Section 8, clause 8, of the Constitution of the United States, provides:

> The Congress shall have Power * * *
>
> * * * * * *
>
> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries * * *.

35 U.S.C. 100(b) provides:

> The term "process" means process, art or method, and includes a new use of a known process, machine, manufacture, composition of matter, or material.

35 U.S.C. 101 provides:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

35 U.S.C. 103 provides:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

STATEMENT

Respondent applied (A. 3–85, 107–109)[1] for a patent on a modified system for using existing general purpose digital computers in conducting the banking business. The system permits a bank to offer checking account customers a bookkeeping service that not only provides the usual overall balance and activity statement, but also furnishes subtotals for various categories of debit and credit transactions, such as rent or

[1] "A." refers to the printed Appendix. "Pet. App." refers to the appendix to the Petition for a Writ of Certiorari. "Br. in Opp." refers to the Brief in Opposition to the Petition.

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fuel payments, sales income or dividends received, etc. Under respondent's system, the customer labels each check (or deposit slip) with an appropriate category code that designates the type of transaction. The bank records this category code on the check (or deposit slip) in magnetic ink characters and stores the category data in the memory of the bank's computer, along with the other data normally associated with the transaction.[2] At the end of the monthly statement period, the bank's computer sorts the customer's transactions according to category codes, and causes information concerning each transaction and a subtotal to be printed out for each category (Pet. App. 3A–7A).[3] Respondent stated that his "invention is being sold as a computer program to banks * * * so that they can perform these data processing services for depositors" (*id.* at 19A).

[2] According to the patent application, banks use digital computers "for the handling of much of the record-keeping operations involved in a banking system" (A. 3). Typically, checks and deposit slips carry the following information (among other data) in magnetic ink (or other machine-readable) characters printed on them: customer's account number, amount of the transaction, and whether the transaction is a deposit (credit) or check (debit). This information is printed in magnetic ink to facilitate the processing of such data by the bank's computer. Respondent's system adds another such item: the code for the transaction category (rent payments, etc.), so that the computer can process this item along with the others (A. 4–5).

[3] The result is analogous to the customer's writing "rent," "fuel" or the like on each check as he draws it (or similarly marking each deposit slip) and, upon receipt of each monthly statement, sorting out the cashed checks and the deposit slips in each category into separate piles and adding up the subtotal for each pile.

The patent application (see A. 3–85) describes the necessary steps in the operation, contains flow diagrams for the operation of this type of program, and gives as an example a specific program for use on the IBM 1400 series general purpose digital computer. Respondent sought to patent the system both as a "process" and as a "machine system" or apparatus.[4] A typical "machine system" claim, set out in the opinion of the court below (Pet. App. 5A–7A; see A. 107–109, in addition to describing the usual operations of such a computer, provides in substance:

> A record-keeping machine system for financial accounts, said system comprising a data processor (such as the IBM 1400) including the usual components, and having means for processing category-coded transaction data to compute subtotals for each category, as well as means for producing an output record of each category's subtotal.

The patent examiner rejected all the claims as being anticipated by prior art and hence unpatentable under 35 U.S.C. 102 (see A. 89–91) and for other reasons.[5] Respondent appealed to the Patent and Trademark Office Board of Appeals, which did not adopt all of the examiner's grounds for rejection, but instead rejected the claims on new grounds (pursuant to 37 C.F.R. 1.196). It said that the claims

[4] As used in patent law, the terms "machine" and "apparatus" are synonymous.

[5] The examiner also found respondent's claims invalid under 35 U.S.C. 112 for not "particularly pointing out and distinctly claiming" what he considers to be his invention (see A. 91–92). The rejection under Section 112 is not in issue here.

were "not directed to improve record keeping machinery, but rather to a broad system of keeping financial records where the distinction over acknowledged prior record-keeping is either in the identity of the * * * institution which has custody of certain phases of the bookkeeping operation or in * * * the relationship existing between the various records," and that the claims thus do not "spell out * * * any particular configuration of business machinery" (Pet. App. 29A). Such claims do not define a patentable "machine," the Board stated, because the invention, if any, is only in the meaning (rent account, dividend account, etc.) given by the user to the pattern of electrical signals stored in the computer's memory. A preexisting computer performing with a particular program does not become a different machine merely because the user has assigned different meanings to various sections of its memory.[6] As the Board explained (*id.* at 30A):

[6] The Board appears to have rejected the claims as not covering statutorily patentable subject matter on the ground that the program did not enhance the internal functioning of the machine, but was merely a process for using the computer outside the "technological arts" and hence unpatentable under prior decisions of the Court of Customs and Patent Appeals (Pet. App. 31A–34A). *E.g.*, *Application of Musgrave*, 431 F. 2d 882, 893; *Application of Foster*, 438 F. 2d 1011, 1015; *Application of Benson*, 441 F. 2d 682, 688, reversed on other grounds *sub nom. Gottschalk* v. *Benson*, 409 U.S. 63. In so holding, the Board nevertheless recognized that under the case law as it then stood (*i.e.*, prior to *Gottschalk* v. *Benson*, *supra*), as declared by the Court of Customs and Patent Appeals, "an unprogrammed, or a differently programmed, general purpose computer is [not] the same machine as the one that would result from appellant's programming of the same or of a similar computer" (Pet. App. 28A). The Board noted that the examiner had apparently operated on the contrary "premise" (*ibid.*).

> There can be no structural or operational relationship of a computer memory with the meaning one chooses to assign outside the computer to a particular configuration of binary digits or "bits" in its memory. Although a a group of such bits is processed as an alphanumeric character within the computer this results from the physical states of the memory cells and manifestly this is unrelated to whether a series of such characters represents a stock number of a part or a sum of money, outside the computer. A computer operating with any given stored program is not a different machine simply because one chooses to denominate a section of its memory by a term descriptive of one meaning, such as a file of stock numbers rather than a file of sums of money.

The Board concluded (Pet. App. 33A) that there was "no essential difference in substance" between the "machine system" or "apparatus" format used in the claims now before this Court, and respondent's "process" claims (the format subsequently ruled unpatentable in *Gottschalk* v. *Benson*, 409 U.S. 63, under 35 U.S.C. 101). The Board stated that respondent's "machine system" or apparatus claims simply covered a conventional data processor having " 'means' for performing conventional bookkeeping and accounting operations" (Pet. App. 33A). The Board therefore held that the "machine system" claims and the process

claims "must stand or fall together" (*ibid.*), and rejected them all as involving subject matter that is unpatentable under 35 U.S.C. 101.

The Board also ruled that the claims were "obvious variations" (Pet. App. 34A) of conventional bookkeeping systems[7] and of a system previously disclosed in a prior patent (the Dirks patent (see A. 94–106), cited by the examiner),[8] and hence that they were unpatentable under 35 U.S.C. 103.[9]

Subsequent to the Board's decision, but before that of the court below, this Court decided *Gottschalk* v. *Benson, supra*, reversing the judgment of the Court of Customs and Patent Appeals in *Application of Benson*, 441 F. 2d 682, and holding unpatentable a claim for a "process" to be embodied in a program and used in a general purpose digital computer. In his appeal to the court below respondent initially challenged the

[7] The conventional systems to which the Board referred are multiple account systems by which banks carry "special," "trust," "escrow," or "personal" accounts and the like for a single customer. By combining totals from the statements for each of the accounts into a single statement, the bank can readily furnish the customer the same kind of data as respondent claims to do in his alleged invention (Pet. App. 34A–35A).

[8] The Dirks patent claimed certain computer devices, but its introductory specification explained and disclosed, among other things, a cost accounting system for mercantile establishments. The Board considered it obvious to modify that system to implement respondent's idea since the most significant difference between the two systems was merely whether they were employed in stores (Dirks) or banks (respondent) (*id.* at 35A).

[9] Like the examiner (see p. 7, *supra*, n. 6), the Board also rejected respondent's claims "for indefiniteness in failing to distinctly point out the invention" as required by 35 U.S.C. 112 (Pet. App. 29A–31A).

Board's failure to follow the decision of that court in *Application of Benson, supra* (A. 112), but, following this Court's reversal of that decision,[10] he abandoned his "process' claims and pressed only his alternative "machine system" claims (Pet. App. 2A, n. 1).

The Court of Customs and Patent Appeals reversed 3-to-2, holding that this Court's decision in *Benson* applied only to process claims and was not "applicable" to apparatus claims (Pet. App. 14A). Because respondent's claims expressly purported to cover a "machine system," the court rejected the Board's conclusion that the application claimed subject matter that was unpatentable under Section 101 (*id.* at 13A–14A). *Benson* was also inapposite, in the court's view, because Benson's claims covered a mathematical formula or algorithm, in contrast with respondent's business or financial record-keeping system (*id.* at 14A). Finally, the court overturned the Board's rejection for obviousness because it did not regard respondent's alleged invention as "equivalent" to the prior art (*id.* at 15A–16A).[11]

Chief Judge Markey dissented. For him, the mere fact that differences existed between the prior art and the claimed advance did not suffice to make the advance unobvious (*id.* at 16A–17A).

[10] Respondent had obtained in the court below a suspension of proceedings pending this Court's decision in *Benson* (A. 1).

[11] The court also reversed the Board's rejection under 35 U.S.C. 112 (see p. 8, *supra*, n. 9), concluding that respondent's claims were adequately directed to a machine rather than only the relationship of a bank and its customers (Pet. App. 12A–13A).

Judge Rich dissented separately on the basis of *Benson* (*id.* at 17A–22A). Respondent's invention, if any, he said, was a program to be used in an existing general purpose digital computer. That the respondent's claims were cast in the format of a machine claim ("machine system" or "apparatus") rather than a "process" claim format was immaterial, since "[e]very competent patent draftsman knows how to do that," and Benson could readily have cast his process claims in "machine system" form similar to respondent's (*id.* at 20A). Judge Rich stated that the "legal doctrine that a new program makes an old general purpose digital computer into a new and different machine," on which the majority implicitly relied in its opinion, was a "legal fiction" which was not helpful in deciding whether a program claimed as such a "machine" was patentable in view of *Benson* (*id.* at 19A). Since the majority's distinctions between the instant case and *Benson* were not "realistic" and were a matter of "form rather than substance," Judge Rich found *Benson* controlling and would have affirmed the rejection (*id.* at 21A–22A).

SUMMARY OF ARGUMENT

1. Despite the superficial complexity and obscurity of the language of respondent's patent application, the nature of his alleged invention is quite simple. In essence, it is the idea of having banks provide an additional record-keeping service for their checking account customers by programming existing types of general purpose digital computers to record and proc-

ess a category code specified by the customer for each debit and credit transaction (*e.g.*, "rent" check; "dividend" deposit) and to include in periodic statements a breakdown showing subtotals for each category. Respondent does not claim to have invented any new computer apparatus. Nor does he claim that the means of implementing his idea by programming a computer is inventive in itself; the idea concededly involves use and modification of standard, conventional, programs now used by banks.

Although respondent's idea is embodied, and has been reduced to practice, in the form of a program for an existing general purpose digital computer, the asserted inventiveness lies in the idea underlying the program, not the actual preparation of the program itself. Accordingly, what respondent seeks—and what the Court of Customs and Patent Appeals awarded him—is a monopoly on the idea of using existing computers (which are inherently designed to serve a variety of data processing purposes) for certain additional somewhat different, types of applications.

2. A. The monopoly on an idea that respondent seeks is unavailable because, under established principles recently reaffirmed by this Court in *Gottschalk* v. *Benson*, 409 U.S. 63, ideas do not constitute patentable subject matter under existing law. The discovery of a new idea can be the basis of a patent grant only when the idea is embodied in a novel machine or process. In addition, such a machine or process must itself be "unobvious" and otherwise satisfy the statutory requirements for patentability. It is not enough if,

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once the idea was disclosed, the implementation of it in a machine or process would be obvious to anyone skilled in the pertinent arts.

B. The implementation of respondent's idea is not patentable, whether viewed as a program for a general purpose digital computer or as a computer reprogrammed for a special purpose. Since the earliest patent laws, one who invents a new use for an existing machine has not thereby been entitled to a machine patent.

Although a "process" patent is now available under 35 U.S.C. 100(b) and 101 to one who invents a new use for an old machine (if other conditions of patentability are met), respondent has abandoned his process claims and cannot rely upon them to sustain the decision below granting him a patent on his "machine" claims.

In any event, in *Benson* this Court held that process patents are unavailable under present law for new programs for existing general purpose digital computers.

C. Respondent's idea for programming existing general purpose digital computers does not, when implemented, produce a "new machine" or "machine system" on which respondent may claim a machine patent. If respondent's claim were sustained, any computer program that, like Benson's, is unpatentable as a process, could be recast as a "machine system" so as to be the basis for an even broader patent monopoly than that sought and rejected in *Benson;* this would, in effect, extend for the originator of the pro-

gram, the patents covering such machines. To say that a reprogrammed general purpose digital computer is a "new machine" each time it accepts a program for an additional application is to elevate form over substance and to base the grant of an important monopoly right on what Judge Rich, in dissent below, correctly called "a legal fiction" (Pet. App. 19A).

If patent rights should be extended to programs or programming ideas for general purpose digital computers, then "considered action by the Congress is needed." *Benson, supra,* 409 U.S. at 73.

3. Even if respondent's programming idea involved patentable subject matter, the decision below awarding him a patent should be reversed because, in light of the prior art and practices of banks, his "invention" would have been obvious to one skilled in the art of devising computer programs. For example, respondent's idea is an obvious extension both of the practices of banks in maintaining separate special accounts for particular customers, and the Dirks patent, which disclosed a system of maintaining diverse accounts for varied divisions of a large enterprise.

ARGUMENT

I. INTRODUCTION: COMPUTERS, PROGRAMS, AND RESPONDENT'S CLAIMED DISCOVERY

The issues in this case are (1) whether respondent's claimed invention concerning a new use of existing general purpose digital computers constitstes patentable subject matter, and (2) whether that new use was unobvious to one skilled in the art of devising

such uses. The questions are interrelated, for the determination of what constitutes patentable subject matter establishes a framework within which the question of obviousness may be assessed, and delineation of the assertedly non-obvious aspect of the claimed invention can focus more precisely the analysis of whether it involves patentable subject matter. Therefore we will begin by considering what it is that respondent claims he has invented that is sufficiently novel and unobvious to be entitled to a patent monopoly against all others who would use such computers in like fashion. Because respondent's claims are cast in not only the specialized language of patent applications but the esoteric terminology used to describe even a routine operation of a general purpose digital computer, they may be more readily explained if we first describe such computers and programs briefly.

A computer, for present purposes,[12] is an electronic device that, pursuant to appropriate controls, can perform specified arithmetical and logical operations so as to process data stored in its "memory" or presented as part of the "input" to the computer, and to present the results in a designated form of "output." The particular operations to be performed by a com-

[12] The nature of computers and computer programs was extensively canvassed in the numerous briefs of the parties and the *amici* in *Gottschalk* v. *Benson*, October Term 1972, No. 71–485. The issues in this case, however, do not require as deep an acquaintance with the technicalities of computer operations as did that case. For a recent and more detailed treatment of the matters discussed in the text, see 4 *New Encyclopedia Britannica: Macropaedia* 1045–1058 (15th ed. 1974).

puter are governed by the state and configuration[13] of its electronic circuitry and other apparatus. Such circuitry can be fully built into the computer through wires and other physical elements (*i.e.*, as part of the "hardware"), in which case, unless it is physically rewired, the computer will ordinarily serve only a specific purpose or application.

Alternatively, the computer may be designed so that the state or configuration of its circuitry can readily be changed without rewiring or other visible physical changes. Such changes are accomplished by the use of different "programs" which through various means (*e.g.*, punched cards, tapes, disks) transmit instructions and data to the computer, in a code or "language" that the computer has been designed or programmed to "understand," for conversion to electronic impulses. "Digital" computers, but not "analog" computers, operate in this manner.[14]

Some programs, called "system software," are directed only to certain standard essential operations of the computer itself (*e.g.*, translating, sorting) that are required to serve virtually any end use of the computer. Others, called "applications software" or "applications programs," are designed to make the

[13] "State" refers to the internal molecular or electronic condition of a part (*e.g.*, magnetized in one polarity or another; charged or uncharged), while "configuration" refers to the physical location and arrangement of parts.

[14] While digital computers operate by counting discrete signals, analog computers operate continuously by measuring variables, and typically consist of fixed-wire apparatus that do not accommodate varied programs of instructions. About 90 percent of the computers now in use are digital computers.

computer perform specified data processing operations for particular users. It is the latter type of program that is involved in this case and is generally denoted by references to computer programs in common parlance.

A general purpose digital computer is designed to operate under a variety of different programs to perform diverse data processing operations. Flexibility is its essence. As the Court observed in *Gottschalk* v. *Benson,* 409 U.S. 63, 68, the end uses of such computers "vary from the operation of a train to verification of drivers' licenses to researching the lawbooks for precedents * * *." But such tasks are simply different uses for a machine that is specifically designed to perform a wide variety of tasks involving the processing of complex or voluminous data, in some cases implementing different applications programs virtually simultaneously. Simply put, the difference between a general purpose digital computer (with which we will be concerned hereafter), and a fixed wire computer is like the difference between a player piano and a music box, respectively.

In considering claimed inventions involving the use of existing general purpose digital computers, it is useful to focus on three successive modes of activity: (1) formulating the ultimate purpose to be served by a computer operation; (2) implementing that purpose or idea by determining what data should be stored in the computer's memory or be included in the input to the computers, and what steps the computer should be instructed to take in processing the data; and (3)

translating those instructions into a special form and language that the computer can read. The term "program," while in a sense referring only to the product of the third phase, which may involve no more than a rather routine or mechanical operation, is also used generically to encompass the second phase as well.[15] In some cases, moreover, the implementation of the purpose to be served may require the use of other apparatus in conjunction with the computer.

Theoretically, inventiveness could be claimed for any of these steps. Thus, one might claim to have invented, singly or in combination: a new end use for a known computer, a new set of instructions to a computer to accomplish a specified operation,[16] a new language by which to instruct the computer, or a new device (or combination of a computer with an existing device).

As we shall see, the alleged inventiveness or novel discovery supporting the respondent's claim to a patent resides only in the first, and most abstract, mode—the general idea or purpose that the com-

[15] We do not suggest that every issue concerning the application of the existing patent laws to computer programs can and must be analyzed by reference to this tri-partite framework, although we believe that it usefully characterizes the broad range of computer programming.

[16] In *Benson*, for example, the general idea of converting from binary coded decimal numerals into pure binary numerals (a conversion used primarily in computer operations) was not claimed to be inventive, as that could previously be done without a computer by use of tables. 409 U.S. at 67. Rather, the invention claimed was the formula or program for instructing a general purpose digital computer to take specified steps to make the conversion. See *id.* at 64, 67, 73–74.

puter would be programmed to implement. This idea (rather than merely the commercially exploitable program means for implementing it, see p. 4, *supra*) as such is what respondent asserts to be sufficiently novel and unobvious to be patentable.

More specifically, respondent's alleged "invention" consists of the idea of having banks program and use their existing computers, through conventional programming techniques, to perform for their customers simple bookkeeping services that the customers either perform for themselves, hire a bookkeeper to perform, or else forego. The service consists of preparing balance statement subtotals for credits and debits in categories designated by the customer, such as rent payments, fuel payments, dividends received, sales income, and the like. As conceded by respondents (see p. 4, *supra*), the "invention" is marketed to banks in the form of an appropriate computer program, which the banks can then use on their conventional general purpose digital computers (*e.g.*, the IBM 1400).

"Stated without artifice," [17] at the heart of respondent's claimed invention is the idea of including on the check or deposit slip an additional item of information—a number or letter code (see A. 9–10) designating one of several previously specified categories into which the particular transaction falls—which the bank's computer then stores and processes in essentially the same manner as it already stores and proc-

[17] *Great Atl. & Pac. Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147, 149.

esses other data associated with the transactions. See generally Mayer, *The Bankers* 119–154 (1974). As the sample check included in respondent's application indicates (Fig. 4, A. 72, reproduced below) it is as if, by adding the category code ("CAT. NO.") to the customer's account number, a series of sub-accounts were established:

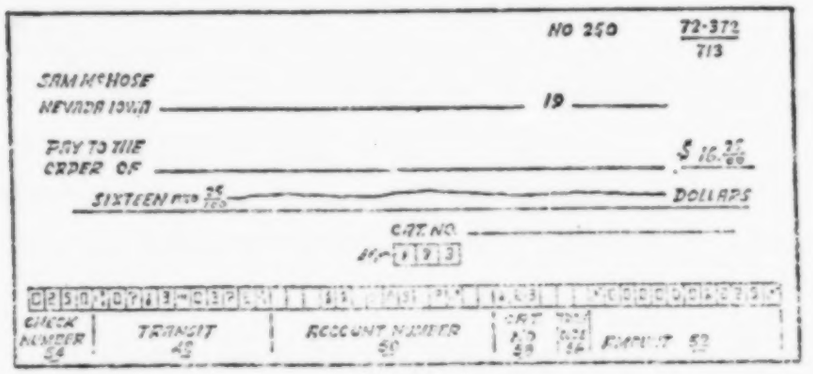

Fig. 4.

Although respondent characterizes his invention as consisting of the "machine system" that results when a conventional digital computer is programmed to implement this idea, he does not claim to have invented a computer, nor does he claim that the program of instructions to the computer to implement the idea are themselves sufficiently inventive to be a patentable "Discovery" contemplated by the patent clause of the Constitution and by the Patent Code. Indeed, respondent's application acknowledges that a typical program would embody "known" and "standard techniques" (A. 12) and modifications of "conventional" or "ordinary" computer processing of bank accounts (A. 12).

Respondent's claimed invention, therefore, is not like a novel telegraph apparatus or any other piece of tangible machinery. The "means" disclosed by respondent are those of an ordinary general purpose digital computer, as presently used by banks, with a program directing the components of the computer to sort check and deposit data into different categories in the conventional way the computer performs such tasks, and then conventionally to print out the results of the sorting operation.

II. AS A NEW IDEA FOR USING EXISTING GENERAL PURPOSE DIGITAL COMPUTERS, RESPONDENT'S CLAIMED INVENTION DOES NOT CONSTITUTE PATENTABLE SUBJECT MATTER

As we have seen, the gist of respondent's claimed invention is the idea of having banks modify their usage of existing computers so as to include and process an additional item of information (the category code) associated with each transaction in its customers' checking accounts. Thus, as is often the case with new developments in the field of computer applications, the assertedly imaginative element consists essentially of the idea of combining and relating specific types of data in a particular manner.

Now that banks generally use computers, it is unlikely that any proposal for supplying more than the most simple statements to their customers would be of practical use to banks unless it could be carried out on existing computers. Indeed, this is the fundamental premise of respondent's disclosure, as set forth in his application (A. 3). Thus, because respondent's idea,

like Benson's, "has no substantial practical application except in connection with a digital computer," a patent on respondent's "machine system" would "wholly pre-empt" use of that idea and in "practical effect" would be a patent on the idea. See *Benson, supra,* 409 U.S. at 71–72.

But, however unobvious they may be, ideas have always constituted "nonstatutory" and thus unpatentable subject matter. What may be patentable is the specific and tangible application of novel ideas in some concrete form to a specific use, in which the idea is concretely embodied in a novel and inventive machine, article of manufacture, chemical or other physical composition, or process for making or using such machinery, manufactures, or compositions. The rationale of the rule against patenting ideas *per se* is that hindering the free exchange and spread in use of mathematical, scientific and other ideas by an indiscriminate grant of patent monopolies would obstruct, rather than promote, "the Progress of Science and useful Arts." U.S. Const., Art. I, Sec. 8, Cl. 8.

Thus, this Court stated in *Benson* that "[p]henomena of nature, though just discovered, mental processes, and abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work." 409 U.S. at 67; see *O'Reilly* v. *Morse,* 15 How. 62, 112–113. The same principle has been applied to business ideas, because patents on methods of transacting business would destroy legitimate competition, just as patents on scientific ideas would impede scientific progress. See *Joseph E. Sea-*

gram & Sons, Inc. v. *Marzall,* 180 F. 2d 26, 28 (C.A.D.C.) (denying patent on method of testing consumer product preferences).[18]

For example, the idea of the self-service cafeteria like Morse's idea of transmitting information at a distance by means of electromagnetic force (see *Benson, supra,* 409 U.S. at 68), cannot be patented. See *Loew's Drive-In Theatres, Inc.* v. *Park-In Theatres, Inc.,* 174 F. 2d 547, 552 (C.A. 1), certiorari denied, 338 U.S. 822. No matter how novel, such ideas can be the basis for a patent, if at all, only in terms of, and to the extent of, their embodiment in a novel machine (such as Morse's telegraph apparatus or the coin-operated food dispensing machine used in certain cafeterias) or in a novel process.

Even when an idea is unobvious its implementation must be unobvious, as well, to justify the grant of a patent monopoly, whether the implementation involves a process or a product. The patent laws require that not only must there be the application of the idea to a new and useful end (embodied in a specific, tangible product or process), but the conception and devising of the end product or process must dis-

[18] The federal courts have repeatedly held that ideas for methods of doing business are not patentable. *E.g., Guthrie* v. *Curlett,* 10 F. 2d 725 (C.A. 2) (method of abbreviating rail tariff schedules); *Berardini* v. *Tocci,* 190 Fed. 329, 332–333 (C.C.S.D. N.Y.), affirmed on the opinion below, 200 Fed. 1021 (C.A. 2) (system of using code messages for banking transactions); *Hotel Security Checking Co.* v. *Lorraine Co.,* 160 Fed. 467, 469 (C.A. 2) (restaurant bookkeeping system). See also *Conover* v. *Coe,* 99 F. 2d 377, 379 (C.A.D.C.).

play the inventive faculty. The means or mode of implementing the idea must extend beyond the routine, conventional, or obvious applications of the idea that follow once the idea is known. See, *e.g., Benson, supra,* 409 U.S. at 67–68; *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.,* 333 U.S. 127, 130;[19] *Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.,* 396 F. 2d 70, 73–74 (C.A. 3);[20] *National Lead Co.* v. *Western Lead Products Co.,* 324 F. 2d 539, 542 (C.A. 9); *Davison Chemical Corp.* v. *Joliet Chemicals, Inc.,* 179 F. 2d 793, 794–795 (C.A. 7), certiorari denied, 340 U.S. 816; *Loew's Drive-In Theatres, Inc.* v. *Park-In Theatres, Inc., supra,* 174 F. 2d at 551–552.

[19] In *Funk* the patent covered a particular mixture of strains of bacteria useful in fixing nitrogen in soil, because the strains were not mutually inhibitory. The discovery that such strains existed was not inventive, because it was a natural phenomenon or principle. As for making the patented product, this was obvious "once nature's secret of the non-inhibitive quality of certain strains of the species of Rhizobium was discovered * * *", and the patent was therefore invalid. 333 U.S. at 131–132.

[20] In *Armour* the court stated (396 F. 2d at 74–75): "[T]he test of patentability of a natural phenomenon is as follows: Would an artisan, knowing the newly discovered natural phenomenon require more than ordinary skill to discover the process by which to apply that phenomenon as the patentee had done? * * * Once nature's secret that the ileum [intestine] would absorb trypsin [the enzyme] was uncovered, any artisan would have known the process of enterically coating the trypsin to enable it to pass through the acidic environment of the stomach and continue into the ileum. * * * Assuming *arguendo* that * * * [the patentee had discovered that trypsin absorbed in the ileum had an anti-inflammatory effect, his] application of that newly discovered principle would itself have to be inventive in order to sustain patent '93."

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In other words, the process or apparatus implementing a new idea must itself satisfy the conditions of patentability, in which case a patent monopoly may be granted, not on the idea, but on the inventive process or product.[21]

[21] The Court of Customs and Patent Appeals has apparently taken a different view. See *Application of Prater*, 415 F. 2d 1393, 1405–1406, holding that an analog computer structured to implement a new idea is patentable, and not obvious, even if, once the idea is known, any skilled programmer could devise a program to carry it out on a general purpose digital computer. The decision below implicitly rests on this premise, as did the opinion of the Court of Customs and Patent Appeals in *Application of Benson*. We submit that that court's interpretation of the statute, to the extent that it survives this Court's decision in *Benson*, is erroneous and in conflict with *Funk*, *supra*, as well as the cited decisions of the courts of appeals.

It is also in conflict with the legislative history of Section 101, which reveals the rejection of a provision (H.R. 9133, § 101, 81st Cong., 2d Sess. (1950)) that would have overruled *Funk* and permitted the patenting of a noninventive application of a newly-discovered natural principle. See Hearings on H.R. 3760 before Subcommittee No. 3 of the House Committee on the Judiciary, 82d Cong., 1st Sess. 116–123 (1951); cf. 98 Cong. Rec. 9323 (1952) (quoted in *Aro Mfg. Co.* v. *Convertible Top Co.*, 365 U.S. 336, 347, n. 2 (concurring opinion)). As this Court said in *Deepsouth Packing Co.* v. *Laitram Corp.*, 406 U.S. 518, 531:

"* * * we should not expand patent rights by overruling or modifying our prior cases construing the patent statutes, unless the argument for expansion of privilege is based on more than mere inference from ambiguous statutory language. We would require a clear and certain signal from Congress before approving the position of a litigant who, as respondent here, argues that the beachhead of privilege is wider, and the area of public use narrower, than courts had previously thought. No such signal legitimizes respondent's position in this litigation."

III. THE IMPLEMENTATION OF RESPONDENT'S NEW IDEA FOR COMPUTER USAGE IS NOT PATENTABLE

Respondent seeks a patent by reason of having devised a new use for an existing machine, the conventional general purpose digital computer. While one who invents a new use for an existing machine may under some circumstances be entitled to a patent monopoly, respondent's new use does not qualify for such a grant.

A. A NEW USE FOR AN EXISTING MACHINE IS NOT PATENTABLE AS A MACHINE

Since the enactment of the first patent law in 1790 (1 Stat. 109), Congress and the courts have adhered to the principle that a new use for an old machine can never be patented as a machine. See, *e.g.*, *Roberts* v. *Ryer*, 91 U.S. 150, 157 ("It is no new invention to use an old machine for a new purpose"); *Ansonia Brass and Copper Co.* v. *Electrical Supply Co.*, 144 U.S. 11, 18; *General Elec. Co.* v. *Jewel Incandescent Lamp Co.*, 326 U.S. 242, 247–249; *Old Town Ribbon & Carbon Co.* v. *Columbia Ribbon & Carbon Mfg. Co.*, 159 F. 2d 379, 382 (C.A. 2) (L. Hand, J.); *Exer-Genie, Inc.* v. *McDonald*, 453 F. 2d 132, 134–135 (C.A. 9), certiorari denied, 405 U.S. 1075; cf. *Application of Zierden*, 411 F. 2d 1325, 1328–1329 (C.C.P.A.).

Like much of American patent law, as embodied both in statutes and in decisions of the courts, this principle was first expressed by Thomas Jefferson. In his famous letter to Isaac McPherson in 1813

(cited in *Graham* v. *John Deere Co.*, 383 U.S. 1, 8 n. 2, 10, n. 3). Jefferson said:

> If one person invents a knife convenient for pointing our pens, another cannot have a patent right for the same knife to point our pencils. A compass was invented for navigating the sea; another could not have a patent right for using it to survey land. A machine for threshing *wheat* has been invented in Scotland; a second person cannot get a patent right for the same machine to thresh *oats*, a third *rye*, a fourth *peas*, a fifth *clover*, etc. A string of buckets is invented and used for raising water, ore, etc., can a second have a patent right to the same machine for raising wheat, a third oats, a fourth rye, a fifth peas, etc.? [VI *Writings of Thomas Jefferson* 176–177 (Washington ed. 1854).]

He added that one of the general rules established by the patent board, of which he had been a member, was that (*id.* at 181)—

> a machine of which we were possessed, might be applied by every man to any use of which it is susceptible and that this right ought not to be taken from him and given to a monopolist, because the first perhaps had occasion so to apply it.

The insightful analysis Jefferson addressed to the simpler machines of his day applies with equal force to machines as complex and versatile as the modern general purpose digital computer. When the principal benefit of an existing machine lies in the versatility of its applications, no conventional use of the machine for a new purpose entitles anyone to an exclusive

patent monopoly covering the machine.

B. A NEW USE FOR AN EXISTING MACHINE COULD BE PATENTABLE (IF AT ALL) ONLY AS A "PROCESS," BUT RESPONDENT HAS ABANDONED HIS PROCESS CLAIMS AND THIS COURT HAS HELD PROCESS PATENTS UNAVAILABLE FOR PROGRAMS FOR GENERAL PURPOSE DIGITAL COMPUTERS

In revising the Patent Code in 1952 (see 66 Stat. 797), Congress explicitly recognized limited patent protection for one who invents a new use for an existing machine. Thus, in Section 100(b) Congress defined "process" as including "a new use of a known * * * machine * * * " (35 U.S.C. 100(b)), while Section 101 provides that one who invents or discovers "any new and useful process, * * * or any new and useful improvement thereof, may obtain a patent therefor," subject to the other conditions and requirements of the Patent Code (*e.g.*, novelty and non-obviousness). 35 U.S.C. 101. Enactment of Section 100(b) did not affect the established principle that a new use of an old machine is not patentable as a machine; rather, it simply meant that a new use could be patentable, if at all, only as a process. See *Application of Hack*, 245 F. 2d 246, 248 (C.C.P.A.) ("discoverer of a new use must protect his discovery by means of process or method claims and not product claims").

Respondent, however, has abandoned his "process" claims for the new use of computers involved here (see pp. 8–9, *supra*). As a result, he has eliminated what would have been the only possible basis for patentability of a new use of existing general purpose digital computers. Abandonment of the process claims

was well-advised—and their retention would not have availed respondent here—because in *Benson* this Court held that a program that had no substantial practical application except in connection with a general purpose digital computer was not a patentable "process" within the meaning of Sections 100(b) and 101 of the Patent Code.

Thus, in *Benson* this Court reversed a judgment of the court below, which had allowed a patent monopoly over a method for using a conventional, general purpose digital computer to convert one form of numerical information (binary-coded decimal) to another (pure binary). In response to the suggestion that its decision "precludes a patent for any program servicing a computer" (409 U.S. at 71), the Court stated that it did not so hold (*ibid.*), explaining that it dealt only with a program for a digital computer and did not extend its holding against patentability to analog computers (*ibid.*). The Court concluded that "[i]f these programs are to be [made] patentable," then Congress must deal with the matter (*id.* at 73, footnote omitted).

While the outer boundaries of the *Benson* ruling may not be precisely defined (see the dissenting opinion of Judge Rich below, Pet. App. 19A), we believe that it covers the instant case. Respondent claims an idea for programming, in the ordinary way, a conventional, general purpose digital computer. At a minimum, *Benson* precludes patent monopolies on such programs as processes—the only relevant category—regardless of the possible patentability of other types of computer programs.

The rationale of *Benson* is that such programs are not sufficiently removed, inventively, from the ideas they embody. The translation of an idea into a program for a conventional, general purpose digital computer no more imports patentability to the idea than does the translation of the idea from English to French or from English to Fortran (or any other computer language). Programs for use of conventional, general purpose digital computers are unpatentable under *Benson,* unless perhaps, at the very least, they "synergize" with the computer, so that the two co-act in an improved, new, and unobvious manner combining "ordinary elements in an extraordinary way" (*Deepsouth Packing Co.* v. *Laitram Corp.,* 406 U.S. 518, 521) in which "the whole in some way exceeds the sum of its parts." *Great Atl. & Pac. Tea Co.* v. *Supermarket Equipment Corp.,* 340 U.S. 147, 152; *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co.,* 396 U.S. 57, 61. Respondent's programming idea does not meet this test.

C. THE PROGRAMMING OF AN EXISTING GENERAL PURPOSE DIGITAL COMPUTER DOES NOT CREATE A "NEW MACHINE" OR "MACHINE SYSTEM" FOR WHICH A PATENT MONOPOLY MAY BE GRANTED

Respondent has attempted, by inventive semantics and a facile drafting device, to circumvent the foregoing barriers to obtaining a patent on his idea for programming existing digital computers. Thus, rather

than seeking a machine patent by claiming discovery of a new use for an existing machine (barred by long-standing authority), he claims that an existing digital computer programmed to implement his idea is a "new machine," and rather than seeking a process patent on his idea for use of a computer (barred by *Benson*), he presses his claims in terms of a "machine system" consisting of the programmed computer. These efforts are without merit.

In no meaningful sense has respondent invented a "new machine" or "machine system." The only actual machine involved is the familiar general purpose digital computer, which is inherently capable of performing a wide variety of data processing tasks when so instructed through appropriate programs. If one could call such a computer, each time its program is modified, a "new machine," it would be so only in a purely linguistic or rhetorical sense, not in any pragmatic and realistic sense; it would be a "new machine" devised not by a mechanic or artisan but by one skilled in "the highly developed art of drafting patent claims * * *." *Brenner* v. *Manson,* 383 U.S. 519, 534.

The court below elevated form over substance in declaring *Benson* not "applicable" merely because respondent's patent application characterized his idea as a "machine system." That holding would provide a simple means for circumventing the important principle applied in *Benson*. As in that case, respondent's idea involves, at best, merely a new use for an existing machine, and that idea should no more be patent-

able when described here as a new "machine system" than when described in *Benson* as a new "process." As Judge Rich observed, any competent patent draftsman can readily convert claims from one format to the other (Pet. App. 20A).[22]

Respondent contends that he has "devised a [new] single special-purpose computer" (Br. in Opp. 4). He argues (*id.* at 5) that his "claims *per se* do not raise any issue of computer programs; they do not call for the use of a computer program in the construction of respondent's special-purpose computer," because a "wired computer-circuitry version" of respondent's program could instead be used to carry out the idea of performing the bookkeeping service,[23] and that, in any event, "a program inserted in a general-purpose computer creates a new machine" (*id.* at 6). The latter view appears to be based upon *Application of Bernhart,* 417 F. 2d 1395, 1400 (C.C.P.A.) (see Pet. App. 7A, n. 3). As applied to respondent's patent application, at least, such an analysis cannot withstand scrutiny.

First, respondent's own description of his alleged invention, in the court below, conceded that this invention "was reduced to practice in the software form of computer programs (Pet. App. 19A)" and "is being

[22] We have set out in Appendix D to the petition (p. 37A) the typical *Benson* claim (see 409 U.S. 73–74) recast in respondent's "machine system" format.

[23] This contention is, however, at variance with respondent's assertion that "[t]he invention is a single practical special-purpose computer, while the prior art's impractical alternative would require many special-purpose computers, each inflexibly set to a user's particular format and procedure" (Br. in Opp. 10).

sold as a computer program to banks and to other data processing companies so that they can perform these data processing services for depositors" (*ibid*). In addition, respondent's application, and his disclosure required under 35 U.S.C. 112, are expressly founded upon the use of existing automatic data processing equipment employing general purpose digital computers for bank record-keeping (A. 3); thus, the court below observed that the general control for the bookkeeping system, "as allegedly reduced to practice, is in the form of a software program" and that the application illustrates its use by means of a complete program and flow chart "for use with a known commercial general-purpose computer, the IBM 1400 series, to provide the special-purpose computer which forms the apparatus of appellant's invention" (Pet. App. 5A). More importantly, respondent has not claimed or disclosed a new "hardware" special purpose machine in his application. As Judge Rich recognized in dissent, respondent has proposed only a software program for use in the existing hardware of general purpose computers (*id.* at 19A). If respondent's invention is embodied in the program, it simply cannot encompass in any relevant way the various existing machines with which it may be used.

Second, respondent's suggested use of wired computer circuitry, instead of programming, is without substantial practical application. Respondent sells his idea to banks as a program, to use in conjunction with the banks' existing program routines for processing checks and deposits. Banks would have no interest in

destroying the versatility of their general-purpose computers (often leased) by building "wired computer-circuitry versions" of the program into the machine. This is as unrealistic as the argument, rejected in *Benson* (409 U.S. at 71–72), that the conversion method in issue there could be of practical use in anything but a general purpose digital computer.

Finally, respondent's premise (based on *Bernhart*) that a program in a general purpose computer creates a new special purpose machine, is unsound.[24] As Judge

[24] Respondent contends that the Commissioner is jurisdictionally barred from challenging here the rationale of the Court of Customs and Patent Appeals. He reasons that the Board of Appeals' decision rejected the examiner's apparent premise that a particular program does not convert a general purpose computer into a different machine, and that the Commissioner could not appeal the Board's ruling (which in any event was adverse to respondent) or any statement made in the course of that ruling. We have answered this contention in detail in our Reply Brief filed in answer to respondent's Brief in Opposition. In summary, we contend that when the Board of Appeals has substituted its own rejection for the examiner's (under 37 C.F.R. 1.196(b)), a judgment of the Court of Customs and Patent Appeals reversing the Board's ruling (brought before this Court on a writ of certiorari under 28 U.S.C. 1256) may be considered in the light of the rationale of the examiner's ruling as well as that of the Board. Limitations imposed on the Commissioner by 35 U.S.C. 141, 142 and 144 do not restrict the authority of this Court under 28 U.S.C. 1256 to review the entire case. *Brenner* v. *Manson*, *supra*, 383 U.S. at 523, n. 6.

In any event, respondent's notice of appeal (A. 110–115) challenged every aspect of the Board's decision, including: the Board's application of the then-unreversed decision of the Court of Customs and Patent Appeals in *Application of Benson*, *supra;* the Board's determination that the claims did not in-

Rich pointed out, "the legal doctrine that a new program makes an old general purpose digital computer into a new and different machine * * * partakes of the nature of a legal fiction when it comes to drafting claims" (*id.* at 19A). The Board of Appeals properly observed that, even assuming (as the Board did, see pp. 6–7, *supra,* n. 6) the correctness of *Bernhart, supra,* there is no structural or operational change in the physical identity of the computer simply because respondent, the bank, or the bank's customer has decided to associate a new meaning with a particular physical state of memory cells within the computer, *i.e.,* that a particular combination of signals in a particular context is to be deemed "rent" or "dividends" (see Pet. App. 30A). Nor does a general purpose digital computer become a "different" machine simply because respondent, the bank, or the bank's customer chooses to have such an association made (see *ibid.*).

(Continued)
volve patentable subject matter; its conclusion that the claims did not concern a particular apparatus or enhance its functioning; and its holding that, in substance, there was no difference between the "machine" and "process" claims, which the Board ruled would stand or fall together. Thus, the issues raised in the petition and this brief are properly before this Court, even if (contrary to our contention in the preceding paragraph) the Patent Code's provisions were held to limit the scope of this Court's certiorari jurisdiction.

Finally, this Court's decision in *Benson*, rendered after respondent had filed his "reasons of appeal" (A. 110), required the court below to apply *Benson* and permits the Commissioner to challenge in this Court its failure to do so properly. Cf. *Bradley* v. *School Board*, 416 U.S. 696, 711–721; *Thorpe* v. *Housing Authority*, 393 U.S. 268, 281.

There is no basis in the Patent Code, its legislative history, or the prior decisions of this Court for this strained and unreasonable conception of identity and difference.[25] A new program in an old computer no more turns the computer into a "new" machine (let alone a new and unobvious one) than: putting a new piano roll into an old player piano makes it a "new" piano; putting a new recording on an old phonograph turns it into a "new" phonograph;[26] inserting into a "mag card" typewriter a new magnetic card coded with the text of a new letter turns the machine into a "new" typewriter; or shaking an old kaleidoscope turns it into a "new" one. In each case it is precisely the ability to perform in such varied ways that is the essence of the old machine.

The general purpose digital computer used to implement respondent's idea (*e.g.,* the IBM 1400) is not respondent's creation. When the patents covering such machines expire, their subject matter will fall into the public domain. See, *e.g., Scott Paper Co.* v. *Marcalus Mfg. Co.,* 326 U.S. 249, 255–256; *Kellogg Co.* v. *National Biscuit Co.,* 305 U.S. 111, 117. Under the decision of the court below, however, respondent would receive, in effect, a second and further partial monopoly on "making, using, or selling" (35 U.S.C. 154)

[25] Respondent's arbitrary assignment of meaning to "same" and "different" is reminiscent of Heraclitus' concept that one can never step into the "same" river twice because "different" waters will be flowing past.

[26] Cf. *Leeds & Catlin Co.* v. *Victor Talking Mach. Co.*, 213 U.S. 325. See also *Mercoid Corp.* v. *Mid-Continent Inv. Co.*, 320 U.S. 661, 668.

such machines,[27] which *pro tanto* would impermissibly withdraw from the public its right of "free access to materials already available."[28] *Graham* v. *John Deere Co.*, 383 U.S. 1, 6; *Anderson's-Black Rock, Inc.* v. *Pavement Salvage Co., supra,* 396 U.S. at 61. We do not believe that Congress intended the present patent laws to make available such a monopoly.

We acknowledge that the dynamic interrelationship between general purpose digital computers and the software programs through which they are applied to numerous and varying tasks may call for new measures or legal concepts to further reward and stimulate innovation in programming. This Court recognized as much in *Benson* when it called upon Congress to determine "[i]f these programs are to be patentable" (409 U.S. at 73) or otherwise to be protected. But, as the law now stands, however high "a reach of imagi-

[27] Indeed, since "[t]he inventor of a machine is entitled to the benefit of all the uses to which it can be put, no matter whether he had conceived the idea of the use or not" (*Roberts* v. *Ryer*, *supra*, 91 U.S. at 157), respondent's claim of "machine" patent rights on programmed general purpose digital computers (as distinguished from a process claim) would seem to conflict with patents already granted to the inventors of those versatile machines.

[28] The effect of a machine patent would be even broader than that of the process patent held unavailable by this Court in *Benson*, for it would grant the right to exclude others from "making" as well as "using" or "selling" the patented invention. We note that while respondent's claimed invention is directed primarily at the way in which banks can use existing general purpose digital computers, he also suggests the possibility that his idea could be used by other enterprises, such as those operating credit card accounts (A. 65).

native ingenuity" a program for a general purpose digital computer may have demanded from its creator, it is nonetheless not patentable "because it will not be within the terms of the statute." *Old Town Ribbon & Carbon Co.* v. *Columbia Ribbon & Carbon Mfg. Co., supra,* 159 F. 2d at 382. See also *Deepsouth Packing Co.* v. *Laitram Corp., supra,* 406 U.S. at 531.

The sanction given by the court below to respondent's semantic circumvention of *Benson* recalls the sound conclusion of the President's Commission on the Patent System, quoted by this Court in *Benson* (409 U.S. at 72), that under present law—

> [i]ndirect attempts to obtain patents [on computer programs] * * * by drafting claims as a process, or a machine or components thereof programmed in a given manner * * * have confused the issue further and should not be permitted. ["To Promote the Progress of * * * Useful Arts," Report of the President's Commission on the Patent System 13 (1966).][29]

[29] That a computer program or programming idea does not qualify for a patent monopoly does not mean that it is necessarily without more limited legal protection against use by others. In some circumstances it might be entitled to copyright or trade secret protection. See *Kewanee Oil Co.* v. *Bicron Corp.*, 416 U.S. 470. See generally Bender, *Computer Programs: Should They Be Patentable?*, 68 Colum. L. Rev. 241, 248–250 (1968); Breyer, *The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs*, 84 Harv. L. Rev. 281, 340–350 (1970); Comment, *Protecting Proprietary Rights of Computer Programs: The Need for New Legislative Protection*, 21 Cath. U. L. Rev. 181, 191–198 (1971); Note, *Copyright Protection For Computer Programs*, 64 Colum. L. Rev. 1274 (1964).

IV. THE CLAIMED PROGRAMMING IDEA IS OBVIOUS IN LIGHT OF THE PRIOR ART

Even if respondent's idea for a new use of a bank's conventional, general purpose digital computer were deemed potentially to involve patentable subject matter, it would be "obvious" to one skilled in the art of developing uses for computers, and therefore unpatentable under 35 U.S.C. 103, contrary to the ruling of the court below.[30]

As the Board observed in rejecting respondent's claims as obvious (Pet. App. 34A–35A), banks using existing data processing equipment frequently have several accounts for each customer, denominated as "special," "trust," "escrow," "personal," and the like. Each of these terms is comparable to a "category code" as called for by respondent's claims. Although the bank may, for some purposes, regard accounts so denominated as separate accounts of the customer, the bank's treatment of the accounts corresponds to respondent's idea for using category codes. In fact, respondent merely adds the category code to the end of the account number (*e.g.*, p. 19, *supra*) to create, in effect, a series of differing sub-account numbers to be used during the automatic data processing. Thus, under a different label, banks already provide a similar form of record keeping facility, since the computer, in handling a customer's separate special accounts,

[30] The obviousness dispute in this case, over which Chief Judge Markey dissented, concerns the obviousness of the basic idea of associating category codes to credit and debit transactions in checking accounts, not the means of implementing that idea.

credits and debits the accounts and renders periodic summary statements to the customer. Respondent's printing of the summary sheets for all of a customer's special accounts on a single document, with totals for all accounts, is but an obvious extension, as a convenience the customer.[31]

The Board also relied (Pet. App. 35A) on the Dirks prior art patent (see A. 94–106), which discloses a comprehensive automatic data processing system to serve the varied purposes of individual departments of a large business organization. Dirks' system is especially applicable to ledger-type bookkeeping or mercantile cost accounting, and allows personalized files for localized areas of responsibiliy. Each area is assigned an account number in which transaction and balance files are kept and updated. The bookkeeping is on a cost accounting basis, such as for sales of a product. As the Board observed (*ibid.*), despite any superficial differences between mercantile cost accounting and bank bookkeeping, "[t]here is no fundamental difference" in the data processing apparatus or methods used in respondent's claimed invention and in Dirks' patented invention; the equipment and methods are necessarily the same, whether the amount

[31] Moreover, bank practices concerning ordinary checking accounts also embody the essence of respondent's claimed invention. Both with and without computers banks have long recorded appropriate service charges associated with debit transactions and included in the monthly statement a subtotal of that category of charges. They have also provided subtotals of all checks and all deposits. See Penney, *Bank Statements, Cancelled Checks, and Article Four in the Electronic Age*, 65 Mich. L. Rev. 1341, 1357 (1967).

debited represents the value of merchandise or the value of a check.[32]

Note, for example, the computerized accounts payable statement in Chart VIa of the Dirks patent (A. 102). The "customer" here is the cashier of the corporation, responsible for disbursing funds. The particular Item Groups are his "category numbers." Item Group 3 (*e.g.*, Payroll) must be continuously updated and requires obvious subtallies (*e.g.*, tax withholdings, savings bonds, charitable withholdings, automatic deposits in savings institutions, etc.). Moreover, for balance sheet purposes, an overall tally is obviously desirable.

In addition to those passages noted by the Board,[33] Dirks also disclosed that "the departments or other

[32] The finding of the court below that the claimed invention here is not the "equivalent" of Dirks' patented invention (Pet. App. 15A) might be material in determining whether use of respondent's system would infringe Dirks' patent (see, *e.g.*, *Sanitary Refrigerator Co.* v. *Winters*, 280 U.S. 30, 42; *Westinghouse* v. *Boyden Power Brake Co.*, 170 U.S. 537, 568), or whether it is unpatentable under 35 U.S.C. 102 as having been anticipated by prior art. As Chief Judge Markey noted, however, in considering a rejection under Section 103 the question is not "[w]hether * * * Dirks discloses category codes or their equivalent * * * [but] whether the contribution of such category codes * * * is a difference sufficient to render the claimed subject matter unobvious to one skilled in the applicable art" (Pet. App. 17A).

[33] The Board stated (Pet. App. 35A):

> Dirks discloses a comprehensive automatic data processing system for many different purposes in networks of individual departments of a large business corporation ([A. 96] column 6, line 35). This system alows personalized files for localized areas of responsibility ([A. 97] column 7, line 40). Each area is assigned an account number in which transaction and balance files are kept and updated ([A. 98] column 9, lines 21–64). The bookkeeping is on a cost accounting basis ([A. 102] column 18, line 62) such as for sales of a product.

organizational users ["customers"] may retain their authority over operative file systems" (A. 105, column 23, lines 53 and 54) and that "[p]rogramming is very easy and different programs ["master subfiles"] are very easily coordinated" (A. 106, column 26, lines 49 and 50). As noted by the examiner (A. 88), respondent admits that the cited prior art general purpose computers, including that of Dirks, are capable of implementing his idea, when properly programmed.[34]

The differences between respondent's idea and the content of the prior art are so slight that it would have been obvious to a person of ordinary skill in devising uses for computers by banks to have banks provide an additional bookkeeping service by using category codes.[35] Accordingly, the Court of Customs and Patent Appeals erred in holding respondent's idea unobvious and thus patentable. See *Graham* v. *John Deere Co., supra.*

[34] Indeed, no new programming of Dirks' apparatus appears to be necessary, where respondent's claims 20–24 (A. 107–109) are concerned: respondent's master subfile control systems represent programs for individual customers, akin to Dirks' individual programming for corporate divisions.

[35] Even proponents of patent protection for computer programs recognize that because of "lack of inventiveness" relatively few programs would be entitled to patents. *E.g.*, Freed, *Computers and Law—A Reference Work* 303 (4th ed. 1973).

CONCLUSION

For the foregoing reasons, the judgment of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted.

ROBERT H. BORK,
Solicitor General.
THOMAS E. KAUPER,
Assistant Attorney General.
GERALD P. NORTON,
Assistant to the Solicitor General.
HOWARD E. SHAPIRO,
RICHARD H. STERN,
Attorneys.

KARL E. BAKKE,
General Counsel,
Department of Commerce.
JOSEPH F. NAKAMURA,
Solicitor,
JERE W. SEARS,
Deputy Solicitor,
United States Patent and
Trademark Office.

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IN THE

SUPREME COURT OF THE UNITED STATES

October Term, 1975

No. 74-1033

C. MARSHALL DANN,
COMMISSIONER OF PATENTS AND TRADEMARKS,
Petitioner

v.

THOMAS R. JOHNSTON,
Respondent

BRIEF FOR THE RESPONDENT

On Writ of Certiorari to the
United States Court of Customs and Patent Appeals

MORTON C. JACOBS
Attorney for Respondent

828 Suburban Station Building
Philadelphia, Pennsylvania 19103

Of Counsel
RALPH A. JACOBS

THE LEGAL INTELLIGENCER, 66 NORTH JUNIPER STREET, PHILA., PA. 19107 (215) 561-4050

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JURISDICTION

To the extent *certiorari* lies in matters of patent administrative litigation, this Court's jurisdiction rests on 28 U.S.C. §1256 as limited by 35 U.S.C. §141, *et seq*. Petitioner is jurisdictionally barred from reviving Examiner's "new use" rejection which was overruled by the Patent Board of Appeals. *See* Section I of the Argument.

QUESTIONS PRESENTED

1. Whether in matters of patent administrative litigation, this Court's *certiorari* jurisdiction under 28 U.S.C. §1256 is limited by 35 U.S.C. §141, *et seq*.

2. Whether Petitioner is jurisdictionally barred from raising the "new use" rejection which was overruled by the Board of Appeals and was neither appealed to nor argued before the Court of Customs and Patent Appeals.

3. Whether in the absence of a specific congressional exclusion, a special-purpose computer machine can be excluded from the general class of machines constituting statutory matters under 35 U.S.C. §101 by reason of its construction with software rather than hardware for its programming element.

4. Whether the Patent Office denial of patents for "softwire" embodiments of special-purpose computers while granting patents to "hardwire" embodiments is a denial of equal protection of the patent laws.

5. Whether an automatic record-keeping machine for all types of small-volume users (*e.g.*, merchants, professionals, farmers) that enables each to use an individualistic record-keeping format and bookkeeping procedure, and that employs, *inter alia*, a general control for directing the processing operations that are common to most users, which control interacts with and is directed by a master control located in the data files for directing the operations that vary with each user, is an unobvious improvement over the prior art.

STATEMENT

Respondent's invention[1] as described in his patent application is a "machine system for automatic record-keeping of bank checks and deposits," and is concerned with automating by means of a special-purpose computer the widely-varied financial record-keeping required by small-volume users.

The Machine Problem to be Solved.

The Government and large companies employ electronic computers for processing masses of financial data by performing vast numbers of elementary arithmetic operations. A requisite of efficient use of the large-scale computer facilities is that the accounting procedures and ledger formats of such a large-scale user[2] be uniform so that a single special-purpose computer (usually built by programming a general-purpose computer) can handle all of the data processing.

In contrast, low-volume users (*e.g.*, merchants, professionals, farmers) have been prevented from obtaining similar benefit of such computers because the wide variations in the ledger formats and bookkeeping and accounting procedures could not be accommodated by prior art special-purpose computers capable of handling only a single record-keeping format and procedure.

Any single special-purpose computer based on the prior art that would attempt to handle the wide variations in format among small-volume users in addition to being

1. The assignee of the invention is a small company, Rec-Chek, Inc. of Nevada, Iowa, with fewer than ten employees, which has been developing and marketing this invention for several years.

2. An example of a record-keeping system for large-scale users is described in the prior art patent to Dirks (A. 94-106); "A." refers to the printed Appendix; "Pet." refers to the Petition for a Writ of Certiorari; "Br. Pet." to Brief for Petitioner; "R. Br." to Reply Brief for Petitioner, "Br." plus the name of the *amicus* to the Brief thereof.

prohibitively expensive would have other serious drawbacks, since it would require a separate program (in effect, a separate special-purpose computer) for each user. Such a prior art special-purpose computer would not be able easily to accommodate users' needs to make changes or corrections in their formats or procedures, nor would it be able to add new users without difficulty.[3]

The Machine Solution

Respondent recognized that what was needed was a single special-purpose machine which could operate with and accommodate and flexibly adapt to all of the variations in ledger formats and bookkeeping methods that exist.

Respondent devised such a single special-purpose computer (A. 7, 68-9, Figs. 1A, B)[4]. The input to respondent's machine is in the form of all of the checks (A. 72, Fig. 4) and deposit slips of each user, and the output is a completely individualized and updated summary ledger (A. 83, 72; Figs. 11, 12) for each user. Its circuitry is structured to provide the flexibility to accommodate the wide variety presented by a large number of small-volume users so that efficient and economic computerized record-keeping is achieved.

This result is attained by the unique configuration of controls which is at the heart of respondent's invention, as the Court below found (Pet. 5A):

3. It is important to note that these drawbacks would exist whichever one of two alternative modes of computer construction was used, whether built entirely of computer circuitry or constructed by programming the circuitry of a general-purpose computer.

4. The description in the patent application, in accord with 35 U.S.C. §112, 1st para., is in such "terms as to enable any person skilled in the art to which it pertains . . . to make and use the same." The references to the patent application in the Appendix are to relevant portions which set forth more detailed descriptions of the invention.

> The control system . . . [of the special-purpose computer comprises] a general control which is applicable to the processing operations that are common to most [users] and a master control for the operations that vary on an individual basis with each [user]. The general control, as allegedly reduced to practice, is in the form of a software program and the master control is a series of subfiles, one for each [user], which are in the form of a sequence of records containing suitable control mechanisms and the [user's] financial data.

The master control mechanisms of each user's sub-file-circuits (A. 73, Fig. 5) interact with and cooperate with the slave or general controls (A. 74-82; Figs. 6-9) to direct the computer circuitry to perform each user's record-keeping according to the user's own bookkeeping or accounting procedure and in his own format.

Inputs to the machine are combinations of signals representing the transaction data in checks and deposit slips, as well as other financial data of the user. Additional inputs are combinations of electrical control signals that represent the format of each user's financial ledger. The format control signals are stored together with the data signals and can be handled in the same way and with the same ease as data signals. It is these format signals which include the "master control" and it is the fact that they are stored with and manipulated like data that gives the invention the unique flexibility described above.

The signals of the slave control, on the other hand, reside permanently in the memory; they remain the same while the machine processes each user's account. The various functional circuits of the computer are structured by the combined action of the slave control signals and the different ledger control signals (master control) for each user. Only one general or slave control program is employed to function interdependently and in common with all of the different ledger format signals and with the computer's functional circuits. In addition, the slave control includes other general control signals that operate the computer's functional circuits, directing the performance of record-keeping operations such as sorting transactions, sub-totalizing and totalizing.

More specifically, the master file circuits in memory (A. 17-21, 68, 69, 73; Figs. 1A-B, 5C-E) consist of each user's sub-file circuits (A. 73, Figs. 5C-E) whose states can be modified by having control signals and signals for ledger information inserted or removed as though they were data. Each user's sub-file is a set of record circuits, formed as a mix of three parts. One part 164, 167, 170, 171[5] of these record circuits stores the control signals for the format and bookkeeping method of a particular user's ledger. A second part 161, 163, 165, 166, 168, 169 stores other signals representing distinctive ledger information, which signals are used by the machine in composing and printing out the updated ledger in the user's individual format. The third part 168, 169 of these record circuits stores the signals for that user's financial data.

A user's complete ledger format and bookkeeping method and the financial data associated with each portion of the format are stored as combinations of electrical signals in circuits of the user's sub-file Fig. 5C. Thus, the sub-files contain all of the signals for the format variations from one user to the next. A first user's sub-file contains the control signals of a first master ledger format and the associated data signals, followed by a second user's sub-file containing the signals of a second master ledger format and data, and so on for a third and subsequent sub-files.

A special control program[6] Figs. 6-9 structures the computer's functional circuits in accordance with each

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5. Reference numerals are those used in the patent application, reprinted in the previously identified figures and pages of the Appendix.

6. A simple bookkeeping algorithm such as in the prior art cannot be used, because each master sub-file contains a different ledger format with its individual mode of bookkeeping. Thus, the

user's different format control and identifier signals 164, 167, 170, 171 stored in his sub-file record circuits Figs. 5C-E. The functional circuits are configured in a specified way for processing each user's account in accordance with his ledger format and bookkeeping system. Slave controls (*e.g.*, Figs. 8C-D, 422-490, Figs. 9B, 556-578) adapt to the individual variations of the master control and identifier signals 164, 167, 170, 171 stored in each sub-file's record circuits, Fig. 5C.

In operation, the slave control directs the computer circuits to locate a particular user's master sub-file and to locate and identify each of the format control (identifier) signals in the user's sub-file. From the identification of the format control signals the circuits determine the type of record-keeping operations that are required for that user's ledger format. Upon identifying a particular type of operation (*i.e.*, whether a sub-total, a total, or a higher level total, and if a print-out is called for, what ledger information is to be printed out) the slave directs the computer circuits to perform the sequence of functions associated with that operation.

Respondent found that a small group of such signal codes,[7] can identify all of the different types of machine

Note 6—*Continued*

control program cannot be a fixed or invariable one which would handle only a single format. Similarly, a program with different fixed sub-programs built in to provide for all of the format variations would not have the flexibility of respondent's adaptive program, and would require the design of a new sub-program for each new user.

7. The identification codes, which are fundamental to the interaction between the two different parts of the control circuitry in the computer, are employed in association with other coded signals. The latter are category codes that operate with circuit mechanisms for interfacing the computer circuits on the input side with the user. These category code signals also are used to structure the output record form so that there is a consistent interface with the user at the output end of the machine also. Thereby, the machine is structured with mechanisms that insure that all of the

operations that are required for processing the almost unlimited variations that exist among users' ledgers. The slave control program construction adapts to all of these variations; that is, a multi-format construction is achieved with but a single adaptive control program and is therefore a single machine.[8] In addition, respondent's machine structure permits changes to be made in the *controls* for modifying the format or procedure for any small user or for additions of new users to the system, as easily as an error in data (*e.g.*, in an amount of a particular transaction) can be corrected.

The patent claims approved by the Court of Customs and Patent Appeals' decision below are directed to respondent's machine construction employing the aforementioned two-part control mechanism. All the claims specify the different locations of the two controls: (a) the master controls are in the data files so that they can be easily changed (*e.g.*, if a user's bookkeeping format changes or to add a user easily), and (b) the general slave controls permanently stored in memory that remain unchanged for

data is handled consistently, under program control, in accordance with the category codes (*i.e.*, dollars for oranges are added to other dollars for oranges and those for apples to others for apples). This construction is limited to handling financial accounts and for processing different ledger formats.

8. In contrast, the prior art machine systems referred to by the Patent Office consist of data files which are uniformly structured (which, therefore, could *not* contain the master format control information) and a single bookkeeping algorithm which repeatedly operates on each account's data in the exact same fashion. That is, the processing algorithm of the prior art has the single ledger format structure built into it. With this prior art arrangement, each user must walk to the same drummer. Thus, neither respondent's adaptive multi-format system nor any multi-format system is disclosed in the prior art. Moreover, if one wanted to extend the prior art system to handle different ledger formats, a different bookkeeping algorithm would have to be structured for each particular format. Therefore, the prior art would require a separate general control program for each format, and as a result, a multiplicity of individually constructed machines rather than a single machine as here.

all users, including the mechanisms ("means for identifying . . .") for assuring the proper co-action between the two sets of controls. The claims *per se* do not raise any issue of computer programs; they do not call for the use of a computer program in the construction of respondent's special-purpose computer, and they apply also to the wired computer-circuitry-version.[9]

Only machine claims were in the patent application as originally filed. These machine claims were rejected by the Examiner as improper in form under 35 U.S.C. §112 by reason of respondent's preferred construction with a general-purpose computer and a stored computer program, which the Examiner held was a "use for a known machine." (A. 88). Process claims were required by the Examiner instead. The Board of Appeals reversed this "use of a known machine" rejection, since it was clearly predicated on a lack of understanding of the technological facts of computers and computer programs. As the Board held (Pet. 28A):

> . . . an unprogrammed, or a differently programmed, general purpose computer is [not] the same machine as the one that would result from appellant's programming of the same or of a similar computer.

Simply put, a new program inserted in a general-purpose computer creates a new machine that incorporates, as one part, the machine of the general-purpose computer and, as another part, the computer program, which structures the circuits of the general-purpose computer into a certain configuration. In short, "the program restructures the computer," Flores, (1969) "Computer Software," *infra*.

9. Respondent's (A. 66-7) special-purpose computer is also disclosed for construction entirely by equivalent wired computer circuitry known to those skilled in the art, which version is a more costly one given the present state of the computer art and therefore not preferred.

After the "new use" issue was overruled by the Board, it did not arise again until petitioner sought to revive it in the Petition for a Writ of Certiorari before this Court. "New use" was not appealed to the C.C.P.A., and was not argued to nor considered in any way by that court. No evidence has ever been presented in the record about the computer technology to support the legal rejection of "new use." The record is barren of any explanation or rationale for the legal conclusion of "new use,"[10] except for what may be inferred from the above-quoted factual justification given by the Board for its refutation and overruling of the "new use" rejection.

The Examiner also rejected the claims as being "anticipated" by the prior art, *i.e.*, as not being directed to a "new machine" or a new process. This rejection was likewise reversed by the Board of Appeals. The Board entered its own "new rejection" of the claims: One rejection was under 35 U.S.C. §101 on the ground that the claims "would, in effect, grant a monopoly to [respondent] on a method of conducting the banking business since banks would thereby be restricted to the use of their data processing equipment only for their own bookkeeping and not being allowed to freely expand into the business of keeping books for their customers." (Pet. 33A-34A.) The Board also said of the claims (Pet. 27A) that they "are either to a method of bookkeeping . . . or to apparatus that automatically carries out . . . the steps of the bookkeeping method." The Board also entered a rejection under 35 U.S.C. §103 of the claims as obvious in view of the Dirks patent cited by the Examiner and also in view of a modified bank statement system suggested by the Board. The Board also entered two rejections under 35 U.S.C. §112 dealing with formal matters; these rejections have not been pursued here, though the petitioner quotes comments of the Board concerning these §112 rejections.

10. Even the Board was unsure of the rationale and noted what "appeared to be" the "bases for these rejections."

Thereafter, on appeal to the Court of Customs and Patent Appeals, respondent pursued only the original machine claims. Since the Board had reversed the Examiner on "use of a known machine" and confirmed respondent's right to define his invention as a "new machine," the process claims which had been filed at the instance of the Examiner were not pursued in the C.C.P.A. appeal. Respondent did not believe process claims defined the invention as appropriately as machine claims since the invention has as its nub the control mechanism formed as a combination of two specific parts and the specific location and interrelation of those parts. This control mechanism, respondent has always asserted, is part of a machine rather than a process.

The court below reversed all of the Board's rejections. As to the §101 rejection on "a method of doing business," the court held that the "appealed apparatus claims are not shown to cover either a method of doing business or even a method of bookkeeping." The Board's assertion that such a monopoly would ensue, the court said, was "misplaced." (Pet. 14A) "Obviously, banks would be free to . . . expand their services and use any apparatus that they may desire *except* the apparatus set forth in [respondent's] claims."

The court below held that the claimed "[r]ecord-keeping *machine* systems are clearly within the 'technological arts.' Such machine systems, which comprise programmed digital computers, are statutory subject matter," citing *In re Bernhart*, 417 F.2d 1395. The court also noted that the phrase "technological arts, . . . is synonymous with the phrase 'useful arts' as it appears in Article I, Section 8 of the Constitution." (Pet. 13A).

The C.C.P.A. also considered this Court's decision in *Benson*, which was handed down while that appeal was pending. The C.C.P.A. reverted to its decision in the earlier case of *In re Christensen*, 478 F.2d 1392 for its analysis of *Benson*. That case expressed the view of the C.C.P.A. that the issue considered by the Supreme Court in *Benson* was "a narrow one, namely, is a formula for . . . a series of

mathematical calculations a patentable *process*." Accordingly, the court below did not find the holding of *Benson* to be applicable to respondent's machine claims, which "do not claim or encompass a law of nature, a mathematical formula, or an algorithm." (Pet. 14A).

The court below dealt with the two obviousness rejections. As to the modification of the prior art proposed by the Board, the court held that modification as far as it goes "may possibly be obvious," but "further modification . . . in order to achieve the results of [respondent's] claimed apparatus, would not have been obvious to one of ordinary skill in the art who did not have appellant's specification before him." Pet. 15A. In short, the Board's proposed modification did not deal with a multi-format record-keeping machine and certainly not with an adaptive multi-format system produced by the co-acting "master control" and "general control." (Pet. 5A)

As to the rejection on the prior Dirks patent, the court below dismissed it out of hand: "The four brief portions of the Dirks specification referred to by the board and the additional passages of that specification" raised by the solicitor out of "509 pages" of Dirks in the record "simply are not suggestive of the subject matter of the appealed claims." (Pet. 14A)[11]

The court below rejected the Board's arguments on formal and related grounds and pointed out what should have been palpable: The automatic operation was achieved with "not a human being inside or outside [respondent's] apparatus," and that "the identifying operations" of the interacting general controls and master controls "are neither actually performed by a human being, nor can we imagine how they could be realistically performed by a human being. *See In re Bernhart, supra.*" (Pet. 13A)

Judge Rich, in his dissenting opinion below (as in a separate opinion in the earlier case of *In re Christensen, supra*) made it clear that he did not understand this Court's

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11. Judge Markey dissented on the grounds of obviousness.

reasoning in *Benson* and did not agree with its decision. He reaffirmed his belief in "the validity of this principle [that] a new program makes an old general purpose digital computer into a new and different machine." (Pet. 19A) Judge Rich found it significant to contemplate

> . . . the identities of the troops lined up for battle in *Benson* . . . against patenting programs for software, [namely] the collective forces of major hardware . . . manufacturers and their representative associations who, for economic reasons, did not want patents granted *on programs* for their machines.

Judge Rich explained in a recent article that in his opinion in this case he did "not abandon my personal beliefs about" the patentability of the programmed computer technology.[12]

SUMMARY OF ARGUMENT

Respondent has invented an automatic financial record-keeping machine with a unique structure that makes it possible for small-volume users (*e.g.*, merchants, professionals, farmers) to avail themselves of the data-processing facilities of a large-scale electronic computer. Respondent's machine processes the financial records of each user and produces a periodically updated ledger statement in the user's own bookkeeping format. The unique structure of respondent's invention consists of its having two different controls in different locations: a general control for all the machine operations common to most users, and a master control which resides in each user's data files and directs the general control to operate with all of the individual variations in the user's ledger format

12. Giles Sutherland Rich, "Change," 2 *APLA Quarterly Journal*, 214, 226 (1974).

and bookkeeping method. With that control structure, the machine adapts to each user's individual ledger format to process his financial records. None of the prior art cited by the Patent Office is concerned with the problem of constructing a machine to process records of small-volume users having a wide variety of ledger formats, nor with respondent's solution using the two different controls in that machine.

The basis for the Board's and C.C.P.A.'s findings below that respondent has invented a new machine different from an unprogrammed general-purpose computer is seen by consideration of the technological facts of programmed computers. A special-purpose computer is a hierarchical machine system built of basic electronic components which are combined to form logic circuits, which are, in turn, combined to form functional circuits. These functional circuits form a "storehouse of parts" that are themselves configured and sequenced by a program into a special-purpose computer, which is a more complex circuit configuration. The elements at each level serve as building blocks for the next level. In a fixed-wire computer, the logic and function circuits are "hardwired" in a permanent form into the desired configuration. However, in a general-purpose computer having a set of elementary function circuits, a "softwired" program, stored in the form of electronic states of the circuits, structures the function circuits into the desired configuration. Programming a general-purpose computer is like wiring a radio from individual transistors, resistors and other components. If the configuration is novel and unobvious, what has been built is a new machine, be it a radio or a special-purpose computer. It is for the resultant special-purpose machine structure constructed by either hardwire or softwire that respondent seeks patent protection.

Because the capability of a special-purpose computer is the same whether hardwired or softwired, these two forms of construction are engineering equivalents. One could build the same machine structure in hardware or

software, and the decision as to which mode of embodiment to employ depends on economic and technological trade-offs. With respect to the patent statutes, both forms of construction must be treated identically.

Petitioner's opposition to a patent for respondent's invention is based on its preferred mode of construction, namely, with a general-purpose computer and a stored program. The legal theory that it is "a new use for an existing machine," is not supported by any evidence and is but a superficial and inaccurate description of this complex technology. The general-purpose computer is an incomplete or unstructured machine serving as a "storehouse of parts" that is structured by the program. The special-purpose computer is not a "use" of the general-purpose computer but a "different machine," as both tribunals below have held; and the special-purpose computer is properly claimed as a new combination of circuits and electrical means under 35 U.S.C. §112.

The patent claims define a machine and not "a method of doing business" nor an "idea." Anyone would be free to perform similar data processing services for users by means of any other available machine except respondent's machine. The patent claims define a tangible structure and not an intangible process or "idea," nor is any method of bookkeeping or mathematics involved. None of the objections raised by the Court in *Benson, supra*, apply here.

The Commissioner's "new use" rejection in this case seeks to rebut the factual finding by the Board that respondent's invention is not the same machine as the general-purpose computer. That "new use" rejection was overruled by the Board of Appeals, which also affirmed the principle that programming a general-purpose computer restructures the computer so that it is a different machine. The Board also overruled the Examiner on his rejection that the claimed machine was not a new machine. The Commissioner of Patents, who is a member of the Board of Appeals, is bound by both its legal rulings and factual findings. The Commissioner could not and did not appeal to

the C.C.P.A. the Board of Appeals' ruling that the invention was not a "new use," and its "different machine" and "new machine" findings all of which were favorable to the respondent, and the Commissioner is jurisdictionally barred from raising those issues in this Court. 28 U.S.C. §1256, giving this Court jurisdiction over cases in the C.C.P.A., must be read in light of 35 U.S.C. §141, *et seq.* which limits the C.C.P.A.'s jurisdiction over appeals from the Board of Appeals to the review of only those issues decided adversely to the applicant. The C.C.P.A. thereby was without jurisdiction to review the "new-use" ruling and "different machine" and "new machine" findings which were favorable to the respondent. The Patent Office conceded that none of these issues were before the C.C.P.A. by its failure to argue them. Alternatively, if these issues were jurisdictionally before the C.C.P.A., the Patent Office's failure to raise them at that lower judicial level bars it from raising them here. Thus, the clear import of the statute and sound judicial principles dictate that the Commissioner is barred from raising these issues before this Court.

The equal protection guarantee mandates that the treatment of inventors of softwired special-purpose computers be equal to that accorded inventors of hardwired special-purpose computers or any other machine. Petitioner's classification of software inventions as unpatentable is so arbitrary and capricious as to be unconstitutional. All the evidence indicates and both tribunals below have found that software-built special-purpose computers are machines.

To single out the inventors of one class of machine for denial of patent protection is unconstitutional unless supported by some justification that is rationally related to the purposes of this statute. In this case there is no justification, nor could there be because hardware and software are equivalent forms of construction and hardwired special-purpose computers are conceded by all parties to be patentable. In addition, no rationale has ever been sug-

gested for denying patentability to one class of machines solely due to their mode of construction. Great injury has been caused respondent and the nation's interest in innovative software technology by reason of this irrational denial of the incentives of the patent system.

ARGUMENT

I. Petitioner is Jurisdictionally Barred from Contesting In this Appeal the Rulings of His Own Board of Appeals that Respondent's Invention Is Not a Use of an Old Machine but Is in Fact a Different and New Machine.

The heart of the petitioner's case is his characterization of respondent's invention as something other than a machine, namely, "new use of an existing machine."[13] The Board of Appeals overruled the Examiner's "same machine" premise[14], upon which his §112 "use" rejec-

13. *See* Br. Pet. 25-37. At various times, the Government asserts the invention is a "new use" 35 U.S.C. §100(b) (*id.* 30), an abstract idea or a business method (*id.* 20-24). Regardless of the various mischaracterizations, once it is apparent the claimed invention is in fact a machine, the patent statute classifies it as patentable subject matter (35 U.S.C. §101). In addition to the explicit command of the statute, the Equal Protection guarantee mandates the same result; *see* Section III, *infra*.

14. Pet. 28A. The Examiner made, *inter alia*, a specific rejection on the ground that "the claims are considered [by him] to be directed to a use for a known machine." Appendix, 88. The Patent Board of Appeals refused to sustain any of the Examiner's rejections finding them all to be interrelated and based upon the Examiner's invalid premise that a programmed computer is the same machine as an unprogrammed computer. Since the Examiner's §112 rejection of "use for a known machine" was not sustained by the Board it was never appealed to the C.C.P.A. and so is not in issue in this case as the Government concedes in its Brief, at 5, n. 5. The Government seeks to circumvent this fatal jurisdictional defect by extracting the "rationale" of the Examiner's ruling (Pet. Br. 33, n. 24) from the ruling itself and arguing that it has life here and

tion was based, as being contradicted by the facts of computer technology, and found that the invention is a machine structure because respondent's programming of a general-purpose computer restructures the latter into a different machine.[15] The petitioner, a member of the Board of Appeals, 35 U.S.C. §7, is bound by that ruling against the Examiner's "use" and "not a new machine" rejections and may not contest it in this Court.

In *Brenner v. Manson*, 383 U.S. 519, 523, n. 6, the Court noted that since the Board was the Commissioner's *alter ego*,[16] he was "appropriately bound by Board determinations." Similarly, the Court in *Glidden Co. v. Zdanok*, 370 U.S. 530, 580 (1962) recognized that:

> Like naturalization proceedings in a District Court, appeals from Patent Office decisions under 35 U.S.C. §144 are relatively summary—since the record is limited to the evidence allowed by that office—and are not themselves subject to direct review by appeal as of right. It was reasonable for Congress, therefore, to bind only the Patent Office on appeals, and to give private parties whether or not participants in such appeals a further opportunity to contest the

may be considered by this Court. The Examiner's erroneous "same machine" premise, which was rejected by both the Board and the C.C.P.A., is what led him to his equally erroneous conclusion that the claims were directed to "a use for a known machine."

15. Stating its agreement with the longstanding finding of the C.C.P.A. that programming such as respondent's does in fact restructure the computer into a different special-purpose machine, *see, e.g., Prater* and *Bernhart, infra*, the Board reversed the Examiner's rejection as being based on an invalid view of the technology that was used by respondent to build his machine. (Pet. 28A).

16. In fact, the Board is the supreme authority of the Patent Office as to matters that lie within its jurisdiction since the Commissioner may be outvoted by the other members of the Board if he exercises his *ex-officio* power to sit as a member of the Board. Furthermore, it is the Commissioner who is bound by Board determination and not vice-versa.

matter on plenary records developed in litigation elsewhere. This practice but furnishes a further illustration of the specialized jurisdiction of the Court of Customs and Patent Appeals, akin to that of the Commerce Court, in passing upon the consistency with law of expert administrative judgments without undertaking to conclude private parties in nonadministrative litigation.

This Court's *certiorari* jurisdiction over administrative litigation cases from the C.C.P.A. under 28 U.S.C. §1256 must be read in light of the clear intent of the Patent Code to insulate the Board of Appeals' findings favorable to the applicant from any judicial review. As *Glidden* points out, private parties have "a further opportunity to contest the matter on plenary records developed in litigation elsewhere." The fact that the Commissioner may petition for *certiorari* review of a C.C.P.A. decision, as *Brenner* held, does not in any way free him from being bound by rulings of the Board. To hold otherwise would be to permit the Commissioner to appeal from his own Patent Office rulings.

The patent statutes provide that only the applicant may appeal from an adverse decision by the Board, 35 U.S.C. §141, *et seq*. Accordingly, the Commissioner of Patents could not (and did not) raise the "new use," "not a different machine" and "not a new machine" issues in the C.C.P.A. and nowhere in that court's opinion are these matters touched upon.[17] The Commissioner is likewise barred from raising the "new use" issue here. This Court's

17. The C.C.P.A.'s jurisdictional statute 35 U.S.C. §144 states that "the decision shall be confined to the points set forth in the reasons of appeal." None of those points dealt with "new use," nor could they, for respondent was not "dissatisfied with the decision of the Board" (§141) in that respect and did not challenge that favorable aspect of the Board's decision. None of the challanged aspects had anything to do with "new use" or "the rationale of the examiner." The reasons of appeal dealt with the Board's rejections, not with its overruling of the examiner. None of the Board's rejections were in any way grounded on "new use." The Board's rejections did not raise the statutory section §100(b) dealing with "new use," nor did that section arise before the C.C.P.A.

The intervening *Benson* decision led to a full consideration of *Benson* before the C.C.P.A. But *Benson* did not discuss "new use," nor hold that a programmed computer was merely a "new use of an existing machine."

certiorari jurisdiction over cases in the C.C.P.A., 28 U.S.C. §1256, does not encompass what could not have been (and was not) before the C.C.P.A.[18]

The petitioner argues that when the C.C.P.A. reverses the Board on an issue, this Court should be able to review the C.C.P.A.'s reversal in light of the Examiner's rationale[19] as well as that of the Board (Br. Pet. 33, n. 24). That argument is irrelevant to this case because the C.C.P.A. did not reverse the Board on the "new use" issue; it did not have the issue before it and, indeed, was jurisdictionally barred from considering it.[20] Once the Board reversed the examiner and found that the programming of a general-purpose computer to implement respondent's invention

18. The situation is similar to that which arises when one party fails to cross-appeal from a lower court's resolution of a particular issue in a case. Without a cross-appeal this Court is bound to accept the unappealed findings of the tribunal below in deciding the other issues in the case. *See e.g., N.L.R.B. v. International Van Lines*, 409 U.S. 48, 52, n. 4 (unappealed finding that a strike was lawful is binding on the Court in determining whether employees have the right to be rehired). In this case, it is the statutory scheme rather than a failure to appeal which binds the Commissioner.

19. Apparently not content with challenging the Board's hitherto uncontested right to bind the Commissioner by its determination, the Commissioner seeks further to emasculate the Board by proposing that the Board's determinations do not even bind an Examiner. Indeed, the Commissioner would go so far as to exalt the "rationale" of an Examiner to a status above that of the decision-making power of the Board in a vain effort to establish a jurisdictional basis for the "new use" issue.

20. The jurisdictional barrier described in *Brenner* and *Glidden* is also recognized by the C.C.P.A. which notes that its jurisdiction "extends to and embraces none other than the adverse decision from which appellant has [taken an] appeal." *In re Melott*, 331 F.2d 887.

was not a "new use" of the computer but a different machine, the issue is not subject to further direct judicial review.[21]

Were petitioner permitted to bring up for review an issue that was not within the appellate conduit—the specific issues that are appealable and actually appealed to a higher tribunal—the entire patent appeal process would be impaired.

This patent application was originally filed with only machine claims including claims 20-24 which were found patentable by the C.C.P.A. The Examiner rejected (A. 88) those claims on "new use/old machine," holding that claims for a programmed general-purpose computer should be in process form only. Respondent opposed that rejection but added process claims in addition to the machine claims in order to satisfy the Examiner. However, the Examiner thereupon proceeded to reject all the claims by maintaining, *inter alia*, his "new use" rejection as to the machine claims and rejecting as "not new"[22] the process claims which he had solicited.

The Board of Appeals reversed all of the Examiner's rejections, and particularly that of "new use," on the ground that they were premised upon the Examiner's mistaken notion that an unprogrammed general-purpose computer" is the same machine" as respondent's programmed general-purpose computer, Pet. 28A. The Board then substituted its own "method of doing business" rejection on

21. Realizing that he is bound by Board determinations, the Commissioner attempts to portray his Board as not having ruled against "new use." This position betrays a key weakness in the Commissioner's argument. Assuming the Board did not conclusively decide in respondent's favor on "new use," the Commissioner could have pursued it before the C.C.P.A. Not having done so, the Commissioner has at the least waived his right to raise it here. However, to the contrary, the Board unequivocally overruled the Examiner on "new use" and every other rejection (Pet. 28A).

22. Apparently of the view that since the process would be performed by a general-purpose computer, it was not new. The tandem rejections of "new use" and "not new" are discussed below; *see* n. 37.

unstatutory subject matter, which rejection, in turn, was reversed by the C.C.P.A.[23] Only this specific Board rejection, together with that of obviousness,[24] which were before the C.C.P.A. for decision, are properly raised by the Commissioner before this Court.

Once the "new use" rejection was reversed by the Board, that issue was eliminated from the appellate conduit. Congress has given the applicant the exclusive right to appeal and legislated that all matters resolved in the applicant's favor at the Board level are conclusive against the Patent Office. Respondent, after his success before the Board, on the "new use" issue did not pursue the process claims before the C.C.P.A., and limited the appeal issues to the machine claims 20-24. In so doing, respondent relied on the fact that the Board of Appeals had made a final determination of the Patent Office position on the "new-use" issue as it applied to this case by rejecting it and replacing it with the technologically sound "different machine" finding. The judicial process requires the confidence of all litigants that matters finally resolved in a proceeding remain so.

This finality is important to an applicant receiving an adverse Board decision in making a choice between alternative appeal routes. Had the Board ruled in favor of the examiner on "new use" (*i.e.*, rejected the facts of computer restructuring) respondent could have availed himself of the District Court route, 35 U.S.C. §145 and built a fact record to rebut such an unfavorable Board determination. But the Board having agreed with the

23. The C.C.P.A. reversal of the Board's method of doing business rejection did not reinstate the so-called "new use" rejection by the Examiner. As noted *infra*, the C.C.P.A. has consistently rejected any attempt to equate programmed computers with "ideas." Even the Examiner's "new-use" rejection was not applied to the question of statutory subject matter, but solely to his §112 rejection relating to the formal and amendable question of "failing to point out and distinctly claim."

24. The Board rejections on formal grounds, 35 U.S.C. §112, have not been pursued here by the Patent Office.

technologically sound restructuring principle in overruling "new use" there were no factual issues requiring the establishment of a District Court record in support of respondent's position. That is why the respondent appealed to the C.C.P.A., where the appeal is determined "on the evidence produced before the Patent Office." 35 U.S.C. §144. This underscores the appropriateness and soundness of the appellate scheme of barring the Commissioner from raising (here as well as before the C.C.P.A.) legal (as well as factual) questions that were resolved favorably to respondent at the Board of Appeals.[25]

II. Respondent's Invention Is Patentable as a Machine.

A. Respondent's Invention Is A "New Machine."

The entire issue of patentable subject matter in this case is whether respondent has invented a "machine"[26] under 35 U.S.C. §101. Heretofore, any apparatus which operated automatically (that is, without human intervention) was clearly conceded to be a machine.[27] Respondent's invention is a machine on its face, for it achieves a unique end result without "a human being inside or outside [the] apparatus" (C.C.P.A. below, Pet. 13A).

Respondent's special-purpose computer automatically keeps records in different individual formats for a variety of different users. The claims define respondent's invention as a "combination of devices" (*Burr, supra*): *See* 35 U.S.C. §112, 3rd. para.

Petitioner denies the patentability of respondent's invention: a special-purpose computer which is preferably constructed with a stored program and a general-purpose computer. He concedes the physical changes produced by the stored program:

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25. On the other hand, there is no factual record here in support of petitioner's theory of "new use." The factual record in the present case, which consists only of respondent's patent application and the prior art cited by the Patent Office, is manifestly inadequate to support petitioner's position in the face of the findings by both tribunals below and the overwhelming technological evidence against it. The factual record developed by the Patent Office does not attempt to deal with the broad question of computer program patentability, and this Court would venture into deep water if it attempted to reverse the findings of the Patent Board of Appeals and the C.C.P.A. without a fully developed record, including the testimony of experts who had been subjected to cross-examination and a documentary history of the development of computer programming to date. (See Brief *amicus* of Los Angeles and Philadelphia Patent Law Associations, p. 8).

26. As the Court said in *Burr v. Duryee*, 68 U.S. 531, 570: "A machine is a concrete thing; consisting of parts, or of certain devices and combination of devices. The principle of a machine is properly defined to be . . . that peculiar combination of devices which distinguishes it from other machines."

Robinson on Patents, Vol. I, p. 257, §173, defines a machine as "an instrument composed of one or more of the mechanical powers, and capable, when set in motion, of producing, by its own operation, certain predetermined physical effects. It is an artificial rule of action, receiving crude mechanical force from the motive power, and . . . transforming . . . it according to the mode established by that rule."

A renowned computer scientist and Professor of Electrical Engineering at the Massachusetts Institute of Technology has given this definition: "When we talk about a machine we have in mind not only (1) an object of some sort, but (2) an idea of what that object is supposed to do. . . . One expects a machine to have a significant number of 'parts' and to perform some reasonably complex operation on something, but it is difficult to capture in the same definition machines which peel apples and machines which transform coded information signals!" Minsky, M. L., *Computation: Finite and Infinite Machines*, 1967, p. 3. This treatise presents a theoretical analysis of a programmed computer as a machine that is structured by the program; *see, e.g.*, at pp. 200-1.

27. Congress has never exluded any technology from the statutory classes nor from the class of machines with but one exception, the exclusion on atomic weapons 42 U.S.C. §2181a, and never on the mode of construction of a machine, which is the essence of the ruling requested herein by the Patent Office in violation of the clear proscription of 35 U.S.C. §103 that "Patentability shall not be negatived by the manner in which the invention was made."

> "the state or configuration of its circuitry [is] readily changed without rewiring or other visible physical changes, [which] changes are accomplished by the use of different 'programs' " (Br. Pet. 15).

But he nevertheless denies that the invention when so constructed can be claimed as a "machine" under 35 U.S.C. §101.

The Patent Office argues that respondent's invention is "a new use for an existing machine" (Br. Pet. 25) even though the patent claims define a machine structure quite different from that of the general-purpose computer and from any other "existing machine."[28] The Patent Office's argument is that the general-purpose computer is "existing," and a program is merely a "new use" of that general-purpose computer and, therefore, the invention must be defined as a *process*. This procrustean argument is but the first step in the Patent Office position which requires that all programmed computers must be cut or stretched into a uniform framework of "process." The remainder of the argument is the contention that all programs claimed as a process have been held by *Benson* to be abstract ideas and, therefore, unpatentable subject matter, even though the Court categorically stated: "We do not so hold." (*Benson, supra*, at 71.)

Unlike the *Benson* claims, the claims that were found patentable by the court below, are directed to a record-keeping machine for financial accounts, and not to a process, nor to an idea, nor to a mathematical formula or algorithm. Moreover, the claims are directed to tangible machinery having a particular configuration of master and

28. The statutory language of 35 U.S.C. §100(b) is that "a new use of a *known* . . . machine" (emphasis added) is a *process*. As is explained hereinafter, and as the Board of Appeals held below, the programmed computer does not fall within the statutory "new use of a known machine" concept. The Patent Office Brief does not explain what, if any, significance is to be attached to its use of the word "existing" instead of the word "known."

slave control mechanisms whose interrelationships are specifically defined, and also having a processor, a memory, and input and output devices. The claims thus are limited to a particular art and technology, to a machine composed of a particular construction of apparatus and to a particular end use. The only thing that would be patented by these claims is a particular machine, namely, a "configuration" (Br. Pet. 15) of electrical circuits. The same end use can be achieved with other machine constructions than that of the claims. Thus, these machine claims are totally different from and do not fall under the proscription of the "nutshell" and other criteria used in *Benson* to pass adversely on the patentability of the mathematical process in that case.

The Court in *Benson* dealt with the specific "mathematical formula" or "procedure" or "algorithm" before it and did not attempt to pass on the patentability of the entire technology of computer programs. Furthermore, there was no technological record on which such a decision could be grounded.[29]

The "new-use" argument of the Patent Office is directly contradicted by its own concession of the "possibility of

29. Compare the subsequent decision of the German counterpart of *Benson*, the only known case on patents for computer programs of the German Federal Patent Court, decided May 28, 1973, (4 CLSR 474). That German court, much as this Court in *Benson*, did not pass on the patentability of computer programs. That court said it "believes it is neither in a position, nor does it see a reason, to take a basic stand concerning the problem of patentability of computer programs [for the] prerequisite does not exist [of a] definition of the term 'computer program' binding in a patent law consideration."

The German Court also noted this Court's decision in *Benson*, but nonetheless held patentable a process claim which had clear machine limitations: "[T]here is no doubt as concerns the fact that the means used to carry out the process claimed are technical, namely, portions of a data processing apparatus. Since employing these means, as defined in detail in the characterizing method steps, is carried out independently, *i.e.*, without the assistance of a human being, no reservations exist also in this regard with respect to the technical nature of the invention. Finally, there is no doubt that the claimed process serves a technical purpose."

patentability" of software-embodied inventions[29a] and by the facts of the nature of programmed computers. These facts are made clear by (a) the computer experts, (b) the C.C.P.A. findings in other cases, (c) the Patent Office's own findings some years ago, and (d) the Board of Appeals' specific fact finding herein.[30] The computer experts explain the facts of the well-known "feature distinguishing the computer from other mechanisms . . . its restructurability . . . . The program restructures the computer.[31] The findings of fact as to this computer technology by the C.C.P.A. in a long line of cases up to the present[32] have held that a general-purpose computer is a "storehouse of parts":

> But once a program has been introduced, the general-purpose digital computer becomes a special-purpose digital computer (i.e., a specific electrical circuit . . . .)[33]

29a. R. Br. at 2.

30. Consistent with the C.C.P.A. decision herein is the most recently decided case before the Royal Courts of Justice, the Patents Appeal Tribunal of Great Britain. *In the Matter of THE APPLICATION OF BURROUGHS CORPORATION*, 1973, decided on an appeal of Burroughs Corporation, (a member of CBEMA) the Court held that the Applicant's invention "is embodied in the apparatus and programme described which has the effect of permanently controlling the whole system so that it operates in this particular way unless and until the programme is changed . . . T[I]n our view computer programmes which have the effect of controlling computers to operate in a particular way, where such programmes are embodied in physical form, are proper subject matter for letters patent." [citing *Slee & Harris' Applications* (1966 Reports of Patent Cases 194) and *Gever's Application* (1970 Reports of Patent Cases 91)].

31. Professor Ivan Flores, City University of New York "Computer Software," *Science & Technology*, No. 89, May, 1969, pp. 16, 17.

32. *In re Prater and Wei*, 415 F.2d 1393 (1969); *In re Bernhart*, 417 F.2d 1395 (1969); *In re Comstock*, 481 F.2d 905 (1973); *in re Knowlton*, 481 F.2d 1357 (1973).

33. *In re Prater*, *supra*, n. 29.

The special-purpose computer "is physically different from the machine without that program" and is patentable as a machine defined as a new combination of elements under 35 U.S.C. §112.[34] The Patent Office in its Guidelines for Examination of Computer Programs (1966),[35] written in part by members of the Patent Office Board of Appeals,[36] recognized that the stored program converts that " 'warehouse' of unrelated parts" of the general-purpose computer into a "special-purpose machine" which may be patented as "a novel and useful machine combination due to the interrelation of parts . . . and the fact that portions of the complete machine take the form of a replaceable program is of no moment."

In this case, the "new use" argument raised by the Patent Examiner to reject the machine claims, was reversed by the Board of Appeals as based on an *invalid factual premise*. The Board found (Pet. 28A):

> . . . that an unprogrammed, or a differently programmed, general-purpose computer is [not] the same machine as the one that would result from appellant's programming of the same or of a similar computer.

The Board used this same ground for reversing the Examiner's additional rejection under 35 U.S.C. §102 of the machine claims as "not new."[37]

34. In re *Bernhart*, *supra*, at 1400. Judge Rich in his opinion below reaffirmed "the validity of this principle [namely] a new program makes an old general purpose digital computer into a new and different machine" at the same time that he dissented so as to call for this *certiorari*, seeking thereby to cause a reexamination of the *Benson* decision. There has always been unanimity and no dissent in the court below on "the validity of this principle."

35. 829 O.G. 441, 442, by Order of Commissioner of Patents Brenner, August 9, 1966.

36. *See* Commissioner of Patents Brenner, "The Future of Computer Programs in the United States Patent Office," *Law of Software*, 1968, p. B-8.

37. The "new use" and "not new" rejections were employed in tandem in the Patent Office in the nature of a "catch-22". The "new

Thus, the Patent Office seeks to resuscitate herein the "new use" argument contrary to its own factual findings, those of the tribunals below and the computer experts.[38] Petitioner offers no supporting technological facts for his position, and relies on the legalisms of the "new use" theory to rebut the facts. The following discussion of the nature of the computer and stored-program technology is presented in order to assist the Court in understanding (a) the factual findings of the tribunals below that respondent's preferred embodiment of a programmed computer is a "different machine" and a "new machine" and (b) the legal

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Note 37—*Continued*

use" rejection was used by the Examiner to require the "process" claim format. Compliance with that requirement was followed by the "not new" rejection on the grounds that the process steps involved are those of the "existing" general-purpose computer. The Examiner and the petitioner, by treating the invention as a process, give no weight in the claims to the machine limitations to respondent's controls and their interrelationships and different physical locations. The "not new" rejection of the Examiner was made though the Patent Office has never suggested that any of the cited prior art machines operates in the same way, or produces the same end result or is constructed with the same controls.

38. This revival of the examiner's "new use" rejection, which was not and could not have been appealed to the C.C.P.A., is barred jurisdictionally as explained above in Section I. In addition, this Court has made clear that the concurrent findings by both tribunals below of the facts of a technology will not be reversed or questioned by this Court: in a "technical area [the Court] would not overturn the finding of the . . . Board of Appeals . . . not challenged by the C.C.P.A." *Brenner v. Manson, supra*, at 532. Furthermore, there is no factual record to support the Patent Office's argument seeking to justify its legal position. As the Court has stated: "Appeals from Patent Office decisions . . . are relatively summary—since the record is limited to the evidence allowed by that office. . . . It was . . . reasonable for Congress, therefore, to bind only the Patent Office on appeals and to give private parties . . . a further opportunity to contest the matter on *plenary records* developed in litigation elsewhere." *Glidden v. Zdanok*, 370 U.S. 530, 578-9 (1962).

conclusion of the Board that the respondent's invention is not a "new use" as petitioner argues.[39]

1. *Respondent's record-keeping machine system is a circuit configuration.*

Respondent's special-purpose computer is constructed as a configuration[40] of electrical components formed in "a specific electrical circuit."[41] This structure of respondent's machine (and of other machines implemented with a general-purpose digital computer and an internally-stored computer program) is illustrated in the accompanying diagram of the hierarchical structure of a special-purpose computer (*see* p. 30).

In this diagram, each level of the hierarchy,[42] supplies the building blocks out of which the circuits of the next level of the system[43] are built. The bottom level consists of electrical components from which the logic circuits of the next level are configured. The logic circuits are combined into the more complex building blocks—circuits called the "functional units"[44] of the general-purpose computer's processor.[45] These functional units,

39. Petitioner's attempt to have this Court determine by legal fiat and contrary to the facts, the nature of computers and computer programs brings to mind the declaration of the Court of the Special Inquisition that the sun rotated around the earth in the face of Galileo's evidence of a different structural relation of sun and earth; *see* J. Bronowski, *The Ascent of Man*, (1973) p. 213, *et seq.*

40. Defined in Br. Pet. 15, n. 13.

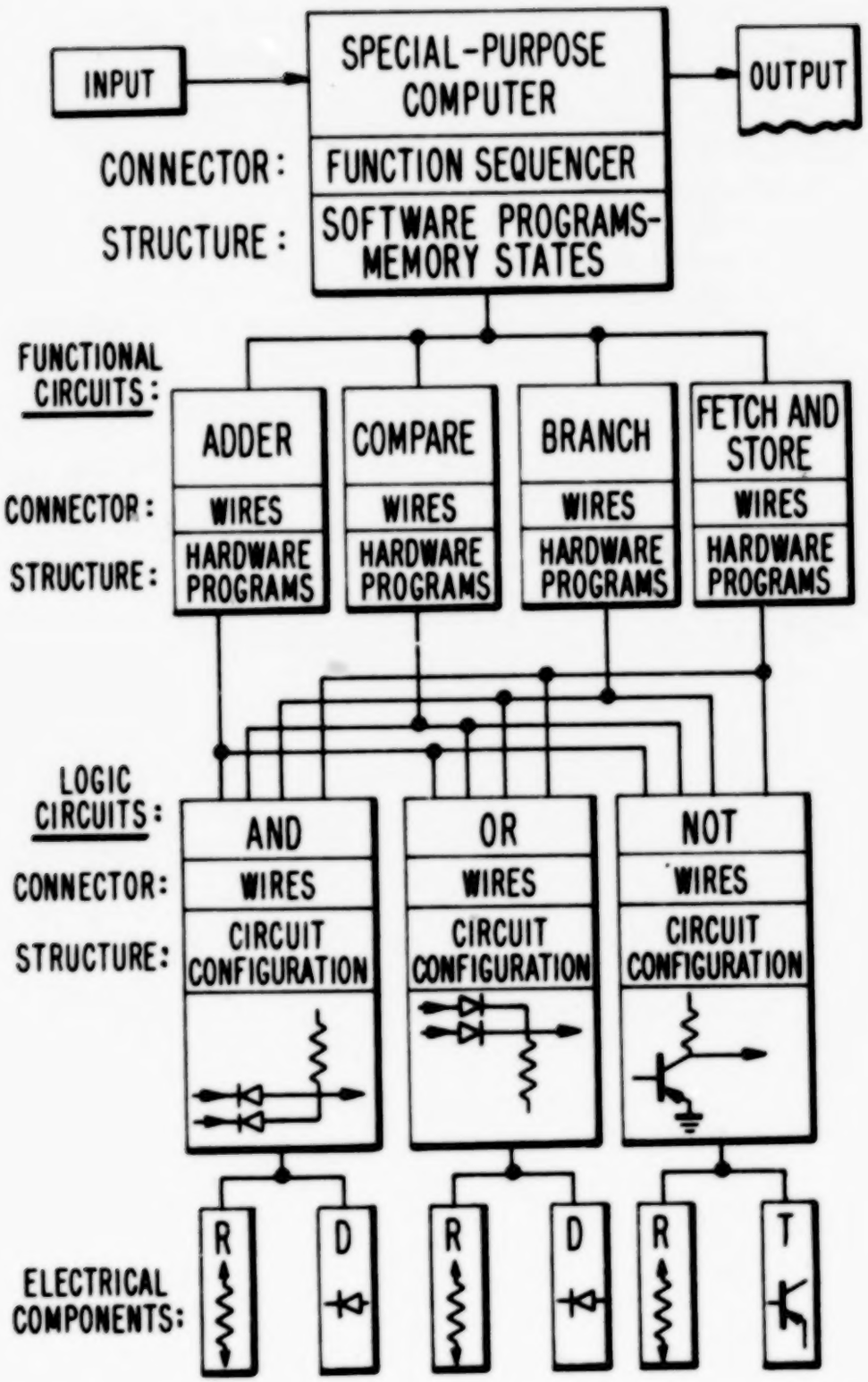
41. *In re Prater, supra.*, n. 29.

42. "*Hierarchy* . . . a rank arrangement in which the nature of function at each higher level becomes more broadly embracive than at the lower level." (A. Iberall, *Toward a General Science of Viable Systems*, McGraw-Hill, 1972, p. 388.

43. "*System*. A complex unity formed of many, often diverse, parts subject to a common plan or serving a common purpose. . . ." (Ibid. at p. 7).

44. Professor Ivan Flores, *Computer Logic: The Functional Design of Digital Computers*, (W. L. Everitt, Editor) Prentice-Hall, Inc., 1960, Chapter Eleven, "Functional Units," pp. 173-207.

45. And into the other circuits (*e.g.*, memory, sequencer control, input and output) that form the general-purpose computer. "The term *logic* . . . describes the interrelation among the primary building blocks of the computer." Flores, *ibid.*, p. 123.



in turn, are combined into the special-purpose computer (such as respondent's) which receives input signals (the checks and deposit slips) and produces output signals (the updated ledgers).

The electrical components, *e.g.*, resistors (R), diodes (D), transistors (T), at the bottom level[46] of the hierarchy are like those used in all modern electronic equipment (*e.g.*, in radar, television, radio, telephone, automation). These electrical components are combined in different circuit configurations to form logic circuits called AND, OR and NOT which transform electrical signals in a manner representative of their named logic operation.[47]

The logic circuits are structured at the next level into functional circuits (Adder, Compare, Fetch and Store and Branch or Conditional Transfer of Control). These functional circuits combine electrical signals in accordance with their named function. The Adder functions to add numbers represented by combinations of signals. Similarly, the Compare circuit operates to compare numbers for the relations of equality and "greater than" and "less than." Fetch and Store are control circuits for moving data signals to and from the memory, which is constructed from millions of flip-flop circuits, the basic storage units for the binary computer signals.[48]

The Branch or Conditional Transfer of Control performs a function unique to digital computers, whereby the sequence of functional circuits can be varied in accordance

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46. At a still lower level of this structional hierarchy, the molecular and atomic substructure of these components (such as the solid-state transistors and diodes) are important factors in their design and in their interrelationships at higher hierarchical levels.

47. The AND circuit produces an active output signal when all of the circuit's inputs are active; OR, when either one or another, or all of its inputs are active; NOT produces an active output when its input is not active. In place of three different types of logic circuits, many digital computers are built from combinations of a single such circuit, the NOR (the negative of OR; its output is active when neither of its inputs are active).

48. The flip-flop is also formed from the logic circuits.

with different *conditions* of the input or processed data. In a simple example, if a first number is greater than a second, one sequence of functional circuits is activated; but if second number is the greater, a different sequence is activated.[49]

A general-purpose computer is configured to have a basic "repertoire" of functional circuits (also called "instructions" or "orders").[50] The structural configuration of each of these functional, control and memory circuits is called "permanent programming"[51] or "hardware programming."[52]

Programs in the broader sense are part of all automatic machines, and automated systems. "*Program elements* determine *what* the automated system shall do and *how* the parts of the system must function in order to accomplish the desired result."[53]

"Software programming"[54] is the structure of the special-purpose computer which configures the functional circuits (Adder, Compare, Branch, etc.) to interconnect certain sequences of those circuits and combinations of

49. As explained in ADR Brief, *amicus curiae*, p. 11, *et seq.* this Branch control (or "Decision") is fundamental to the ability to structure a general-purpose computer into a special-purpose computer by means of software programming.

50. A more elaborate set (*e.g.*, to perform also subtraction, multiplication and division, shifting of numbers, etc.) is often used.

51. I. Flores, (1960), *supra*, p. 42.

52. Prof. Saul Rosen, "Hardware Design Reflecting Software Requirements," 33 *Proc. Fall Joint Computer Conference*, 1968, Pt. II, pp. 1443, 1444.

53. "The program may consist of mechanical parts such as gears, cams, and linkages that connect the various portions of a machine together and determine the timing of the various actions of the machine. In the most modern computer-controlled systems, the program may be stored in the form of punched paper cards, paper tape, magnetic tape, ferrite cores, electronic circuits, or other mechanical or electronic "memory" devices. 2 *New Encyclopedia Britannica: Macropaedia*, 505, 506, "Automation."

54. Term used herein for what is customarily called "computer programming" to avoid semantic confusion with hardware programming.

those sequences.[55] The software programming (the internally stored program) takes the physical form of combinations of different "states"[56] of the memory circuits and of electrical signals that control the states and configurations of the functional circuits.

Software programming resembles hardware programming in a number of respects, and most importantly in the way that lower-level building blocks are structured.[57] However, the connector used with the software for configuring the functional units is a different type from that of the hardware programming. Starting at the bottom level of the hierarchy the electrical components are connected together in the logic circuits by fixed wire or "hardwire" connectors.[58] The logic circuits are similarly hardwire connected into the functional circuits and other circuits of the general-purpose computer. However, at the top of the hierarchy, a "softwire" connector is employed for the software structure. This connector includes a function ("instruction") sequencer, which effectively interconnects the functional circuits in the sequences prescribed by the software programming.[59]

By forming the structure at the top of the hierarchy as electrical signals, that structure can be stored in the

55. Basic repetitive sequences are called "sub-routines." (Br. Pet. 15).

56. (Br. Pet. 15, n. 13).

57. The software and hardware programming are engineering equivalents, as discussed hereinafter.

58. "Hardwire" connections may be made by simply twisting or soldering wires together or in more advanced fabrication by printed circuits or integrated circuits; *see Scientific American* article, May, 1975, "Microprocessors."

59. The function sequencer activates by control signals the circuitry of the functional units at the appropriate times in sequences specified by the software programming. When activated the circuits are effectively "connected," and when inactive they are not. The engineer's term "softwire" refers to use of control signals for the connections. The sequencer, memory, input and output circuits are all part of the general-purpose computer; the control program is in the states of the memory circuits.

computer memory in the same way that other signals are stored. The ability to store the structure of a special-purpose computer in the form of electrical signals gives rise to the ability to replace one such structure by another simply by replacing one set of electrical signals (software program) by another. *This concept of the stored-program computer is the foundation on which the computer industry is built.*

Since the building blocks of each hierarchical level of such computers are nested within those of the next higher level as shown in the diagram, the special-purpose computer at the top level includes all of the elements and structural relations shown in the drawing. This special-purpose computer receives input signals and, within its circuits, combines them and modifies them to produce output signals. The combining and modifying is in accordance with the structure of the stored software programming, which uniquely establishes the "rule of action" of the special-purpose computer.

Respondent's special-purpose computer, in the same way, functions as "a specific electrical circuit"[60] configured out of sequences of functional circuits, which in turn are configured combinations of logic circuits, which in turn are configured combinations of circuit components.

2. The general-purpose computer is an incomplete machine that serves as "a storehouse of parts" and is completed by respondent's stored program to form a new combination as respondent's record-keeping machine.

The general-purpose computer, though extremely complex, is an inchoate, an *incomplete* machine. The functional circuits (Adder, Compare, Branch, etc.) are not interrelated nor do they co-act in any useful way until structured[61] by the software programming into a special-purpose computer. The functional circuits are building

60. *In re Prater, supra.*

61. *See* Flores, (1969), *supra*, pp. 16, 17.

blocks used by the software; and in that respect the general-purpose computer is a " 'warehouse' of unrelated parts."[62]

This "storehouse of parts"[63] character of the general-purpose computer is evident from the hierarchical diagram *supra*, p. 30. Starting at the bottom level, each level serves as a storehouse of parts for the next higher level. The electrical components (resistors, diodes, transistors) serve no purpose by themselves and acquire functions only when connected in the various circuit configurations of the logic circuits. Similarly, the logic circuits serve only as a storehouse of parts for assembling the different circuit configurations of the functional units, and the latter circuits which constitute the general-purpose computer are interconnected by the software programming in the various sequences and combinations that make up the special-purpose computer.

The set of building blocks at each level is similar to the familiar toy Erector Set, whose parts can be connected in an unlimited number of ways to form machines of a wide variety of types. For example, with a storehouse of the electric components (resistors, diodes and transistors, etc.) almost all of the known electrical circuits can be built, including those of the computer logic circuits. With a storehouse of logic circuits, all of the various functional and other circuits of general-purpose computers can be built.[64] Similarly, the function circuits are interconnected by the software into an endless variety of automatic machines—a musical synthesizer, the controls of a lunar landing module, a document reader for electric meter reports, a calculator for thereafter calculating and printing the associ-

62. Patent Office Guidelines (1966), *supra.*

63. *In re Prater, supra.*

64. Special-purpose computers are also built directly from the logic circuits using permanent or hardware programming. One could also use the logic circuits as the functional units of the general-purpose computer, namely, the building blocks for software programming; but "such an approach would be impractically slow." Goldstine, H. H., *The Computer From Pascal to von Neumann*, (1972), p. 257.

ated electric bills. Respondent's record-keeping machine is similarly constructed in its preferred form of construction.

There is no predetermined relationship of the function circuits (Adder, Compare, Branch, etc. or their individual functions) to any of the above special-purpose computers and other devices; they are "*unrelated* parts"[65] (emphasis added). Nor is there a predetermined relationship of the resistors, diodes and transistors to a computer or television set. However, when the functional circuits of the general-purpose computer are structured into a "dynamic interrelationship" (Br. Pet. 36) by software programming—such as that of any of the above examples—these circuits are organized and interrelated by that programming just as are the electrical components in a television circuit. In that condition, the function sequencer makes the softwire connections called for by the stored program so that the functional circuits are connected into a special-purpose computer having the structure called for by the program.

The hardwire programming is used in building the functional circuits from the logic circuits and softwire programming is used in inter connecting the functional circuits into a special-purpose computer; both connect building blocks into more complex structures.

In short, as the Government asserted in another case, a software program may be "a technologically innovative product"[66] and may be demonstrated to have "technological superiority".[67]

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65. Patent Office Guidelines (1966), *supra*.

66. Government's Pretrial Brief in *United States v. IBM*, 69 Civ. 200, at p. 202.

67. *Ibid.* at p. 29. This Government Brief in the IBM case makes it clear that the software industry is in the business of selling technological products (machines) not "ideas" or "methods of doing business." *See* ADAPSO Brief amicus herein, p. 3, *et seq.*, which contrasts the different Government positions in this and the IBM case. *See* ADR Brief *amicus* herein p. 6, *et seq.* for a further discussion of the software industry as a business of machine products.

3. Hardware and software programming are equivalent and alternative approaches for the construction of computer systems and equally patentable.

The Patent Office has set up a false dichotomy in the patentability of computers. Those implemented by hardware programming (*e.g.*, the general-purpose digital computer) are recognized to be machines by petitioner and "patents covering such machines" (Br. Pet. 35) are granted subject to their meeting the statutory tests of novelty (35 U.S.C. §102) and unobviousness (35 U.S.C. §103). However, computers implemented by software programming are generally denied patentability.[68]

Petitioner's distinction between the two alternative forms of computer construction is inconsistent with the well-established technological "principle of the equivalence of [software] programming and hardware. This principle [is based on the fact] that a program for a general-purpose machine turns it into a special-purpose machine."[69]

Respondent's patent application also sets forth (A. 66-7) this equivalence and notes that the invention can be alternatively implemented in a hardwire embodiment.[70]

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68. The Patent Office is not consistent in this respect; many of the Examiners understand the machine structure of software, as shown by the recently issued patent for an "Analytic Character Recognition System" implemented by software, U.S. 3, 873, 972.

69. "The principle becomes more tangible when we compare in detail the logical design of that special-purpose machine with the flow chart of that program." Prof. Saul Gorn, Final Report No. AD 59 URI, at p. 4, from Univ. of Penna. Moore School of Elec. Eng. to U.S. Army Signal Research & Development Labs, 1959.

70. Two engineering approaches are available for constructing a complete hardware version of a special-purpose computer. One is to use the structure of the software programming and connect functional units (or more complex modules) by hardwire connections [*see* article by David M. Robinson, of the University of Delaware, "Digital System Design With Control Modules," *Proceedings of the Seventh Annual Institute of Electrical and Elec-*

Petitioner has acknowledged this equivalence of hardware and software means, namely, that a special-purpose computer can be built either by hardwired logic circuitry or by programming a general-purpose computer.[71] The particular means that is used (as respondent noted in his application, A. 67) depends upon many business and engineering trade-offs.[72]

This equivalence is inherent in the concept of the stored-program computer. The first electronic computer, the ENIAC built about 1945, was "not a stored-program

Note 70—*Continued*

tronic Engineers Computer Society, International Conference, February 27-March 1, 1973]. The other is to redesign the system of the special-purpose computer so that hardware programming is used to configure the logic circuits directly into the final hardwired system. Under 35 U.S.C. §112, the claims herein "shall be construed to cover the corresponding structure . . . described in the specification and equivalents thereof."

71. "The particular operations to be performed by a computer are governed by the state and configuration of its electronic circuitry [which] can be fully built into the computer through wires. . . . Alternatively, the computer may be designed so that the state or configuration of its circuitry can readily be changed without rewiring or other visible physical changes . . . by the use of different 'programs.'" (Br. Pet. 14, 15)

72. "Perhaps the most important part of the job of computer system design is to determine which functions are best handled by hardware, and which should be provided by software. All of the traditional engineering considerations come into play here. One must consider the added cost of additional hardware measured against possible gains in operating efficiency. One must consider the availability of manpower with the appropriate skills for design and for implementation. One must also consider intangible factors such as the inherent advantages of simplicity and the hidden costs of complexity.

"From the point of view of the computer user it makes no difference which features are incorporated into the hardware and which are programmed in software.

"It is the combined hardware-software system, the 'extended machine' that the user must rely on to provide the power and flexibility and convenience that have been promised with each new generation of computing equipment." S. Rosen (1968), *supra*.

computer. Programs were installed and changed by engineers who changed the wiring among its various components."[73] The stored-program concept, invented while the ENIAC was being built, had as its very purpose the replacement of the hardwire connections by the softwire. The first published description[74] of the stored-program computer clearly explained (p. 1, ¶1.2) that the program ("instructions"[75]) was "an integral part of the [computer's] structure."

As far back as 1949, when the first stored-program computer was constructed in England, its builders recognized the equivalence of programming by hardwire and softwire, and explained that additional functional circuits could be added to the computer or the equivalent software programming could be used to implement the same functions.[76]

The Patent Office has no difficulty in finding patentable subject matter in the hardwire approach to building

73. S. Rosen, Purdue University, "Electronic Computers: A Historical Survey," *Computing Surveys*, Vol. 1 (1969), pp. 7, 8.

74. A. W. Burks, H. H. Goldstine, J. von Neumann, *Preliminary Discussion of the Logical Design of an Electronic Computing Instrument*, 1946. In this famous "paper that became a landmark in the history of computer sciences if not in the history of human thought," (4 *New Encyclopedia Britannica: Macropaedia*, 1045, 1047) John von Neumann and his colleagues at the Institute for Advanced Study in Princeton first published "this stored-program concept" on which the modern computer is based and the technology of which underlies the issues in this case.

75. A human receives *instructions* on how to operate the manual choke in an automobile. When an *automatic* choke is built in by means of a "program," we don't think of "instructing" the engine or its controls. Yet that is the terminology of the computer industry established thirty years or more ago to describe the automatic controls of a stored program. The automatic control of the choke in future cars will be done by a more advanced programmed general-purpose computer, and appropriate computer "instructions" will be used for that purpose. *See* Vacroux, *infra*, n. 76, at p. 40.

76. M. V. Wilkes, "Progress in High-Speed Calculating Machine Design," *Nature*, Vol. 164 (1949) pp. 341-3.

special-purpose computers which technologically began to be replaced 30 years ago with stored-program inventions. However, it insists that the stored program approach which is the present foundation of the computer industry and is revolutionizing the entire electronics industry is not patentable.

The equivalence of hardware and software underlies this revolutionary change taking place today in the electronics industry. Programmed microcomputers (general-purpose computers constructed with "microscopic components"[77]) are used to build electronic apparatus in "a wide range of applications from specialized laboratory instruments to sales terminals and electronic games."[78]

"[C]ustom-designed large scale [digital] circuits . . . can be justified only when they are produced in volumes large enough (50,000 units, say) to amortize their development costs." Such expensive electronic systems that "cannot be modified or adapted for an application for which they are not designed" [are being replaced by] "versatile devices such as microprocessors incorporating no custom-made features except the contents of a . . . programmed . . . memory."

"Until recently digital circuits were designed almost exclusively with 'hardwired' logic . . . Although this approach is very powerful (indeed, it is used in most of the electronic equipment manufactured today), it yields an *inflexible* product that is difficult to modify or improve without major redesign. Most of the microcomputers in service today were adopted as a replacement for *inflexible* circuitry. . . . *it is to their flexibility, inherent in all stored-program systems, that they owe most of their popularity.*

* * *

"The automotive industry will probably be the largest single user of microcomputers. They will replace the

77. A. G. Vacroux, "Microcomputers," *supra*, pp. 32, 33.
78. *Ibid.*, p. 34.

custom-designed [hardwire] devices already installed by many manufacturers for monitoring brakes, lights and battery, for seat-belt interlocks and for skid control . . . they will take up many new functions such as the control of ignition, the optimization of the fuel-air mixture, the reduction of exhaust emissions and even the continuous indication of fuel consumption in miles per gallon."[79] (emphasis added)

Thus, the general-purpose computer has become (in miniature size) a tool that is structured by the addition of programs to build all kinds of instruments and apparatus. Each programmed microcomputer is a different electronic machine as is each hardwired device that the programmed microcomputer is replacing. Such electronic machines have unquestionably been patentable subject matter under 35 U.S.C. §101 when hardware programming was used. The objection to patentability based upon the use of the more modern and "flexible" technology of the stored program cannot be justified by any basis in law or fact.[80]

The denial of patents to a modern technology (the softwire mode of building special-purpose computers and other machines) raises anew the question: whether the Patent Office "freeze[s] . . . patents to old technologies, leaving no room for the revelations of the new, onrushing technology." (*Benson, supra*, at 71.)

79. A. G. Vacroux, "Microcomputers," *supra*, pp. 39, 40.

80. The failure to recognize the equivalence of hardware and software opens a pandora's box and leads inevitably to a "raiding" situation in which existing hardware patents have no legal protection from infringing software-constructed devices. *See Digitronics Corp. v. The New York Racing Association*, 67 Civ. 1119, U.S.D.C. (E.D.N.Y.), Memorandum Decision, Sept. 16, 1975. This problem is not limited to the computer field, for many automatic machines have the potential to employ a programmed general-purpose computer to replace their existing electronic, electrical or mechanical controls. *See* 2 *New Encyclopedia Britannica*, "Automation," *supra*.

B. "A Machine Is Not An Idea."

1. The Patent Office's "new use" argument does violence to the technological facts of computers.

The cases cited by the Patent Office do not support its "new use" position because they do not deal with the general-purpose computer or any other restructurable device.

The *new use* doctrine applies under the test set down by this Court in *Roberts v. Ryer*, 91 U.S. 150, 159, where there is "a change only in form, proportions or degree, doing substantially the same thing in the same way by substantially the same means." In that case and in each of the other cited new use cases what was *claimed* was substantially the same structure as the prior art.[81]

In this case respondent's *claimed* invention has an entirely different structure from that of the "existing"

81. In *Roberts v. Ryer*, *supra*, the unpatentable *new use* of an icebox was a *downards* circulation of air through the food chamber while the *old use* had the air circulating *upwards*. In *Ansonia Brass v. Electrical Supply*, 144 U.S. 11, 18, the *new use* of paint was as a noncombustible insulation for electric wires carrying *large* electric currents needed for lighting; it was unpatentable over the *old use* of the insulating paint for electric wires carrying *small* telegraph currents. In *General Electric Co. v. Jewel Incandescent Lamp Co.*, 326 U.S. 242, 247, 249, the *new use* of a second etching for frosted glass electric lamps was that of applying the etching to the *interior* of the glass. It was unpatentable in view of the *old use* of that second etching applied *externally* to electric lamps. In *Exer-Genie, Inc. v. McDonald*, 453 F.2d 132, *certiorari* denied, 405 U.S. 1075, the unpatentable *new use* was exercising with a machine; the *old use* of the same machine was as a fire escape device. In *Old Town Ribbon & Carbon Co. v. Columbia Ribbon & Carbon Mfg. Co.*, 159 F.2d 379, the unpatentable *new use* of duplicating sheets was for a "gelatin pad" duplicating process, where the *old use* of the same sheets was for a "spirit" duplicating process. In *Application of Zierden*, 411 F.2d 1325, the unpatentable *new use* of a chemical composition was that of removing and preventing alluvium deposits in water systems, where the *old use* of the same chemical composition was to prevent deposition of carbonate scale in such water systems.

general-purpose computer.[82] The structure produced by the software programming is:

> "an integral part of the [special-purpose computer's] design structure,"[83]

Respondent's patent claims call for a new combination of elements. Such combinations are patentable as specifically provided for in 35 U.S.C. §112, 3rd ¶, and as approved by the Court in cases from *Burr*, *supra* to *Graham v. Deere*, 383 U.S. 1.[84]

Just as the combination of components forming a novel logic circuit and the combination of logic circuits forming a novel functional circuit are patentable as machines or parts of machines, so are the special-purpose computers that are constructed by softwiring combinations of functional circuits. The universal characteristic of patentable combinations of elements in all technologies is that each of the elements has the "ability to perform . . . in varied ways" (Br. Pet. 35) with other elements to produce new combinations. So, too, the general-purpose computer, that "storehouse of parts," produces a new machine combination when it interacts with a stored program. The "new use" issue does not apply to the new machine combination defined in the claims which has a structure different from any other combination. Petitioner's legal argument of "new use" is

82. The prior art in each of the cited cases had an *old use*. In contrast to these new-use cases, petitioner does not set forth any *old use* of the general-purpose computer in constructing a theory of nonpatentability based on "new use." The unprogrammed general-purpose computer is an *incomplete* machine that has *no* end *use*. Without the structure of a stored program, it does not operate, for the hardware and software are "interdependent," not "independent" as the Patent Office insisted in *Benson*. (*See* Transcript of Oral Argument, hereinafter, Tr. *Benson*, at 4).

83. Burks, Goldstine, von Neumann, *supra*.

84. *See* also *O'Reilly v. Morse*, 56 U.S. (15 How.) 62; *The Telephone Cases*, 126 U.S. 1, *Mackay Radio and Telegraph Co. v. Radio Corp. of America*, 306 U.S. 86.

refuted by the undeniable fact that the general-purpose computer is a "storehouse of parts" structurable by and combinable with a stored program.[85]

Petitioner's brief makes it clear that his entire case is directed not against the claimed special-purpose computer, but against the stored program as a mode of construction for machines. Petitioner specifically attempts to exclude respondent's equivalent hardwire embodiment (A. 66-67) as "unrealistic" (Br. Pet. 33). Petitioner is unable to deny that the *claims* define a special-purpose computer whose general controls can be built with equivalent hardwire. The *claims* do not call for a stored program for the general controls. A hardwire embodiment may be quite realistic, as the cost for hardwire construction is lowered. Petitioner attempts to exclude the hardwire mode of construction from consideration in this case, because none of the "new use" arguments could be applied to hardwire even sophistically.

As to the softwire embodiment, both the C.C.P.A. and Board below agreed that "a new program makes an old general purpose digital computer into a new and different machine" (Pet. 19A) Judge Rich below specifically acknowledged "the validity of this principle" *(Ibid.)* noting that the "court has been through that many times" *(Ibid.)*; there has never been a dissent on that finding of the facts of computer programs.[86]

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85. An inventor of a general-purpose computer is no more "entitled to the benefit of all [its] uses" (Pet. Br. 36), than is the inventor of any other "storehouse of parts" such as the Erector Set or Tinkertoy, or a set of electrical components. Nor would the inventor of an Adder circuit in IBM's 1400 be entitled to use the IBM 1400 free of IBM's patents. The inventor of a patented element of a combination has a right to exclude others from use of that element in a combination, 35 U.S.C. §§271, 281, but he does not by a patent to that element acquire any rights to use of someone else's combination by reason of the element being *usable* therein.

86. The Board of Appeals specifically expressed its agreement with the C.C.P.A. on the validity of this restructuring principle

Petitioner's formulation of his "new use" theory is unsupported by any evidence of the structure of the programmed computer. He produces no facts in support of his theory and ignores the physical changes in the computer's circuitry that cannot be seen with the naked eye. These changes can be fully identified and measured internally, as well as externally by visible evidence of the transformation of input data to processed output data. Petitioner seems to scoff at an inquiry into the *structure* of the special-purpose computer and to argue, by analogy, that one can understand the dynamic structure of a river simply by observing its outer form (Br. Pet. 35, n. 25). Respondent submits, that, just as it is necessary to "step into" *(Ibid.)* a river to understand its "hierarchical

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(Pet. 28A). The Board, without in any way modifying its support of restructuring, also indicated in a formal rejection under 35 U.S.C. §112 (Pet. 30A), that the "meaning one chooses to assign outside the computer to a particular configuration of 'bits' in its memory" is not "structural." Though a program changes the general-purpose computer to "a different machine," such "meaning" does not. Respondent does not disagree with this position and does not assert patentability based on the difference between "a file of stock numbers rather than a file of sums of money." *(Ibid.)* Such a claim limitation does not affect patentability under 35 U.S.C. §101, but goes to the end use of the invention and to the scope of coverage of the patent that is requested. *See McClain v. Ortmayer*, 141 U.S. 419. The Board, however, revealed its lack of understanding of respondent's invention as defined in claims 20-24 (A. 107-9) for the "means for identifying" that the Board refers to (Pet. 30A) are defined in the claims as identifying the "category records" and the "totalizing records" and not "an 'account,' or a 'type of transaction,'" as its opinion states. This identifying means, as explained in the patent application (A. 18, 19, 47, 54, 73, 81, 82), tests the "initial identifier field" 164, 167, 170, 171 for the ledger format control signals. This "means for identifying" is an important part of the mechanism for co-action between the master and general controls, which the Board's opinion did not notice, unlike the C.C.P.A.'s (Pet. 5A).

structure"[87] that reveals the river's inner structure[88] and the "different" aspects of the "same river" *(Ibid.)* so it is necessary to open the doors of the computer housing and investigate its innards, for it also forms a hierarchical system that reveals its structure and the differences produced by a stored program.

Not only is petitioner's "new use" theory unsupported by any evidence in the record, it is contradicted by the evidence and by statements of the experts. Moreover, both the C.C.P.A. and the Board of Appeals below agree that respondent's invention is a "new machine" not a "use." Under these circumstances, the court has ruled

> A court of law, such as this Court is, rather than a court for correction of errors in fact finding, cannot undertake to review concurrent findings of fact by two courts below in the absence of a very obvious and exceptional showing of error. [citations omitted]

Graver Tank & Mfg. Co. v. Linde Air Products, 336 U.S. 271, 275 (1949).

Petitioner's "new use" case[89] culminates in a self-serving and deceptive metaphor which compares the

87. A. Iberall, "Viable Systems," *supra.*, p. 7.

88. "Consider a river flowing downstream as a constant current source. (The velocity field that makes up the river is derived from a gravitational potential and from ground waters.) Consider small particles carried by the stream. As a result of gravity, they fall vertically. Yet, upon their striking the bed of the stream, there is an interaction via hydrodynamic forces . . . The collection of these particles may now be characterized, by a continuum description of the bed load of the river, as a dynamic entity that will be subject to gross dynamic laws as the bed load interacts with elements in the macroscopic river-field (such as bends, changes in river shape or cross-sectional area, or changes in the character of the soil)." *(Ibid.)*

89. The "new use" theory is used spuriously to suggest (Br. Pet. 35-36) that the C.C.P.A. decision below would somehow give respondent a "partial monopoly" (whatever that is) to a general-purpose computer in the public domain. It is true that upon the expiration of IBM's patents on the hardware programming in the IBM 1400 computer, "their subject matter will fall into the public

stored computer program with recording devices such as the piano roll in the player piano. Overlooked entirely is the basic flaw in the analogy that the general-purpose computer is restructured when reprogrammed but the player piano is not restructured when a different piano roll is inserted. The fact that the resultant special-purpose computer has a new structure excludes the possibility that it is merely a new use of an old structure. Since the Patent Office has asserted to the Court that "precisely the heart of our case"[90] rests on this "piano roll" metaphor, it is dealt with in greater detail than it would otherwise merit.

Programs have been developed to structure a general-purpose computer into a musical synthesizer (see Appendix)[91]—an electronic counterpart of peti-

domain" *(Ibid.)* but without any restriction by reason of the patent requested by respondent. First, respondent's invention can also be hardwired and therefore is not limited to being constructed with a general-purpose computer, and with any particular one at that. Second, one or more of the elements of combination patents often are previously patented without the combination patents in any way removing the elements from the public domain. *See Cantrell v. Wallick*, 117 U.S. 689, 694. The parts of the "storehouse of parts" of the IBM 1400 may be combined in any way without restraint so long as they are not structured into respondent's machine, just as patented or unpatented transistors can be combined into patented television sets without removing anything from the public domain. The fact that the Erector Set (or any other kit of building blocks) can be used to construct and thereby infringe a patented combination does not take anything out of the public domain, neither by "partial monopoly" or otherwise, for the patented combination is not in the public domain until its patent expires. As the Court said in *United States v. Dubilier Condenser Corp.*, 289 U.S. 178, 186: "An inventor deprives the public of nothing which it enjoyed before his discovery, but gives something of value to the community by adding to the sum of useful knowledge." *See* also the Briefs *amici* of the American Patent Law Association, p. 11, *et seq.*, and of Software Associates, Inc., p. 24, *et seq.*

90. Tr. *Benson*, p. 17.

91. The musical synthesizer receives as inputs, punch card records (like a piano roll) of the musical notes to be reproduced.

tioner's player piano. The player piano, however, whatever piano roll it may play remains unchanged—still a player piano, with the same structure it had before since the player piano is not restructurable. The piano roll is merely input data, a record of the piano keys to be struck[92] and *not* a program.[93]

The spurious nature of the piano roll metaphor may be further seen by comparing the elementary functional circuits of the general-purpose computer to the end use of the programmed computer. A general-purpose com-

Note 91 —*Continued*

The synthesizer program configures the circuits to generate electrical signals corresponding to the desired musical tones which it may record as output on magnetic tape to be played later, or it can play the music at the same time with appropriate playback equipment. In the musical synthesizer shown in the Appendix the computer program provides additional structure for the illustrated general-purpose computer so that the input to the computer is in the form of sheet music notation (as the photograph illustrates), from which the programmed machine generates the output for reproducing the corresponding music. A composer can write his music and have it played back immediately.

92. A piano roll is a musical recording and any innovation in the music is not technological.

93. A variant of the piano roll metaphor is petitioner's comparison of the player piano and music box (Br. Pet. 16). Both the player piano and music box are special-purpose machines—machines for playing different musical recordings. The only difference is that the piano roll is more easily replaceable than is the recording disc or drum used in the music box. Neither is a general-purpose machine; neither can be changed to be other than what they are. Both the player piano and music box, unlike the incomplete general-purpose computer, are fixed-purpose and complete machines requiring only input data to operate; the input data are the piano roll and recording drum, respectively. A "fixed-wire computer" (Br. Pet. 16) is also a special-purpose machine which receives input and produces output in accordance with its own "rule of action." However, the general-purpose computer is in a unique class of devices—once structured by the addition of programming it becomes a special-purpose machine with the rule of action of the particular fixed-wire computer or other fixed-purpose machine it was structured to become.

puter can be restructured into an infinite variety of special-purpose computers, or fixed-purpose machines ranging from the musical synthesizer to a talking computer, or one for recognition of printed characters, or a computer-operated typesetter or airline reservation system. In any case as the above examples illustrate, the elements that make up the general-purpose computer are not related to its ultimate function. In the case of the musical synthesizer, the functions of the Adder, Compare, Fetch and Store circuits and Branch control are unrelated to the synthesizing of music. This is also true of these other special-purpose computers or machines, all of which are structured out of the same "storehouse of parts," the functional circuits of the general-purpose computer.[94] The elementary nature of their operations do not foretell the types of machines that can be produced from them.[95]

Respondent's invention lies in the structuring of the control mechanisms in two different parts of the overall computer system, and the control of one by the other. This construction leads synergistically to the end result of each user being able to communicate directly with the computer and tell the computer how to keep his books with all his own individuality, and to do this in concert with a thousand others, each having the same freedom of action in keeping his financial accounts in his own way.

94. An important characteristic of a special-purpose computer is its ability to make "decisions," that is, to alter its sequence of operation depending upon the occurrence of certain conditions of operation or in the input or output data. The general-purpose computer is constructed with Compare and Branch circuits so that it can be restructured by a program to incorporate "decision" control mechanisms; that characteristic is nonexistent in the player piano. *See amicus* Brief herein of Applied Data Research, Sec. 2A for a discussion of the "decision" characteristic of special-purpose computers.

95. In the case of respondent's invention there are some relatively simple arithmetic operations that form a part of the system. However, it is not the arithmetic operations as such that are the novelty of this invention.

This "synergistic" result compared to the "several effects" of the individual function circuits (Add, Compare, Branch) is "an effect greater than the sum of the several effects taken separately." *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57, 61 (1969). In contrast to respondent's adaptive machine, in the player piano the strings and their tones have the identical relation to the musical end use whatever piano roll is played. The structure of the piano is never changed.

2. *The claimed invention is a patentable machine, not an "idea" or "method of doing business."*

Unlike other record-keeping machines,[96] which only have one set of controls that directs the processing of the data in the data files, respondent's invention has two sets of controls: a set of general controls for operations common to most users' accounts and a set of specific master controls in the data file of each individual account. This structure of respondent's apparatus gives it the flexibility and adaptability to handle any small user's ledger format. Because there is a master control in each data file, respondent's machine can implement a different bookkeeping system for each customer without the burdensome and inflexible requirement of building into the general program control each individual bookkeeping method and ledger format. Locating the master controls in the data files greatly simplifies the incorporation of changes in each individual customer's bookkeeping system; it is not necessary to change the general control. It is the configuration of machine elements and not the particular bookkeeping system a user has that gives the invention its unique properties. He can have any bookkeeping system he desires with this machine.

The C.C.P.A. recognized that the gist of respondent's

96. Note particularly the prior art cited by petitioner.

invention was a machine structure[97]—the interacting "general control" and "master control" (Pet. 5A)—and held that it was not a method of doing business:

> The appealed apparatus claims are not drawn to cover either a method of doing business or even a method of bookkeeping . . . . [o]bviously, banks would be free to so expand their services and use any apparatus they may desire *except* the apparatus set forth in appellant's claims." (Pet. 14A) (emphasis the court's).

Banks and others are assisted by machines such as respondent's invention in performing additional services for their customers. If they did not wish to use respondent's invention, they would be free to use any other machine construction for performing those identical services, including those proposed by the Patent Office and others.[98] Thus, respondent's invention, like a pen, a typewriter or a cash register, can be used to assist banks or others (such as accountants and data processing centers) in performing services for small businesses, professionals, and others in keeping their financial

97. The C.C.P.A. found the claims were "in typical means-plus-function language, which is especially sanctioned by the third paragraph of §112, the appealed *apparatus* claims are clearly drawn to a 'record-keeping *machine* system' " (Pet. 12A), and that "the claimed *apparatus* automatically performs the identifying operations [of the claims]; those operations are neither actually performed by a human being nor can we imagine how they could realistically be performed by a human being." *See In re Bernhart*. Pet. 13A)

98. The Patent Office has suggested that the machine of the Dirks patent can be used for performing similar services and the Board of Appeals has proposed still another alternative mode of machine construction. Other non-infringing modes of machine construction are also available for performing the same service.

There is *no* infringement when the alleged infringing machine and patented machine "perform different functions, *or* in a different way, *or* produce substantially a different result." *Machine Co. v. Murphy*, 97 U.S. 120; *see Cantrell v. Wallick*, 117 U.S. 689, 695.

records, but would not inhibit anyone from engaging in such services so long as they did not use respondent's invention.

Unlike *Gottschalk v. Benson*, 409 U.S. 63, the invention involved in this case is not an "algorithm," nor a mathematical "procedure." In *Benson*, the Court made it clear that a monopoly for a mathematical algorithm was the issue. In this case no mathematical formula or series of steps is claimed. While the details of a software program are a series of steps, that construction does not convert a machine invention into an unpatentable algorithm any more than the fact that an automobile engine has an automatic control (*e.g.*, a cam shaft) which causes a series of steps to be taken makes the auto engine unpatentable. In the automobile, the steps are mechanical,[99] in this case electrical; both are within the "useful Arts." In *Benson*, the Court was concerned with the steps of the BCD-to-binary conversion algorithm which were purely mathematical, therefore, outside the "useful Arts." It was the mathematical process and not the use of software as a mode of construction that was the defect in *Benson*; Johnston's invention is directed to an innovation in machine control structure, not mathematics and does not suffer from the *Benson* disability. Unlike *Benson*, the claims herein are limited to a particular art and technology, to a particular apparatus and machine, and to a particular end use. The only thing that would be patented by these claims is a machine. *Burr v. Duryee, supra.*

The computer technology deals with a sub-human activity that superficially is associated with the mind.[100]

99. But the program control in an automobile has become more electrical as more complex automatic controls are found to be needed, and will soon be constructed with a programmed general-purpose computer.

100. "[i]n the words of James Clerk Maxwell, 'the human mind is seldom satisfied, and is certainly never exercising its highest functions, when it is doing the work of a calculating machine' . . . Just as the use of man's muscles for pumping water was inefficient, so was the use of his mind for carrying out calculations . . . Computing is thus subhuman in that it calls on very few of man's manifold abilities and yet is fundamental to many of his other activities." *Goldstine, supra*, at p. 343.

Any patent to respondent's special-purpose machine would not cover any "abstract idea," because any bank is free to practice record-keeping by any manual or machine process. The only limitation is respondent's specific machine construction, which is no more the embodiment of an "abstract idea," than is a novel structure for an adding machine.

The Constitution defines the field in which the patent power may be applied as the "useful Arts," U.S. Const., Art. I, §8.[101] This limitation to the technological arts[102] has been implemented by the congressional command that, *inter alia*, *machines* are to be granted patents. As the Board stated (Pet. 31A-32A), "technological" is defined as ". . . improvement in technical processes that increase the productivity of machines and eliminate manual operations." Respondent's invention on both scores is clearly *technological*.

Claims outside the technological arts for mathematical formulas and algorithms, laws of nature, and natural phenomena, are unpatentable; in this category have been included methods of doing business.[103] *Compare Seagram & Sons v. Maryall*, 180 F.2d 26 (claims defining method for sampling consumer preferences in beverages, outside the technological arts held unpatentable subject matter); *Loew's Drive-In Theatres, Inc. v. Park-In Theatres, Inc.*, 174 F.2d 547, (concept of an outdoor movie business to show movies to people sitting in their automobiles was not within the technological arts, hence, unpatentable, though the theater construction itself would be patentable as a "manufacture" if new and unobvious, and specific claims defining concrete embodiment of the drive-in theater were viewed as technological and their

101. *Graham v. John Deere*, 383 U.S. 1.

102. As noted by the court below, the "useful Arts" are the "technological arts," (Pet. 13A).

103. *See Guthrie v. Curlett*, 10 F.2d 725.

non-obviousness tested in the ordinary way, by comparison with the prior art);[104] *O'Reilly v. Morse*, *supra* (a claim for the general idea of transmitting messages at a distance using electromagnetism was held not to be defining a particular technological advance, hence, unpatentable, but claims defining specific electromagnetic apparatus for transmitting messages at a distance, held to be within the technological arts, hence, patentable).

The C.C.P.A. recognized that machines such as respondent's are squarely within the technological arts, hence, patentable subject matter. In its attempt to characterize such inventions as outside the technological arts, the Government misrepresents their nature. The significance of the specific machine structure consisting of the combination of a general control and separate master controls for each user's individualized record-keeping is ignored in petitioner's brief. By ignoring the machine nature of the invention, the Patent Office attempts to convince the Court that all that is claimed is the "idea of having banks program and use their computers to provide an additional service for their customers." That statement is simply false: all that is claimed is a specific machine structure which enables computer centers, accountants, banks or anyone else to do so. Any device with a *different structure* based on "the idea" would not be covered by the patent, and banks would be free to use different apparatus than the particular special-purpose computer defined in the claims to provide the same services respondent's machine provides.

The Patent Office also mischaracterizes the innovative process that goes into the development of a computer program. It suggests (without any evidentiary support whatsoever) that once the ultimate "purpose" of the invention is formulated, the rest of the development of the

104. Claims held unpatentable on obviousness, not on grounds of statutory subject matter.

program is routine (Br. Pet. 16-17).[105] Since the Patent Office attempts to portray the "purpose" of respondent's invention as well as of all programs as a mere abstract idea, arguably the implementation of that abstract idea would have to be unobvious. Such a rule, however, is only invoked in cases such as *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127, 130, which deal with some innovation in the non-technological arts and is simply a guard against patents for tangible embodiments that are nothing more than the underlying unpatentable subject matter.[106]

Petitioner misstates the application of the rule of unobviousness under 35 U.S.C. §103. The invention as a whole must be considered in determining patentability, both conception and the claimed construction; *Graham v. Deere*, 383 U.S. 1, 32. Respondent's conception is not a method of doing business, however useful it may be to businesses. Respondent recognized the problem of providing a machine so constructed as to permit any small user to obtain the benefit of computer processing without losing the individuality of his record-keeping format and procedures. His successful solution to that problem is a novel adaptive computer construction with a combination of interacting master and general control mechanisms that permits the user to supply his ledger format directly to the computer to be effective as controls without requiring the design of a special set of general controls for that format.

105. The innovative process in software programming as in hardware programming relates to overcoming machine problems and "technological roadblocks," (*Computers in the 1980's*, R. Turn, 1974, p. 21). *See* the ADAPSO Brief *amicus* herein, pp. 26-30 for a discussion of "The engineering of software" and "The invention process in software."

106. Even if the *Funk* rule would be applicable to this case, it is submitted that innovative features such as the interacting machine controls identified by the C.C.P.A. herein are in the design of a specific machine structure, not in the formulation of an ultimate purpose.

The discovery of the problem is part of the "invention as a whole" that must be considered for unobviousness, *Eibel v. Paper Co.*, 261 U.S., 45, 68; *United States v. Adams*, 383 U.S. 39, 52. In addition, the conception of the solution of the problem as a set of master controls for retaining the individualities in users' ledger formats is part of the "invention as a whole." Likewise, the implementation of the particular general controls and of the co-action with the master controls, the former functioning as a slave to the latter, is part of the "invention as a whole," as discussed in greater detail below in Section IV dealing with the unobviousness of respondent's invention.[107]

The differences between process and machine are fundamental in dealing with the issues in this case. As the Court said in *Tilghman v. Proctor*, at 728, 12 Otto 707, 728:

> A machine is a thing. A process is an act, or a mode of acting. The one is visible to the eye; an object of perpetual observation. The other is a conception of the mind, seen only by its effects when being executed or performed.

The dichotomy between machine and process is emphasized in *Burr v. Duryee*, *supra*, at 570: "A machine is not . . . an idea." The process is the intangible; the machine is the tangible.

During oral argument in *Benson*, the Patent Office distinguished a machine claim from a method claim as follows (Tr. *Benson*, 10):

> But in the case of machines or other tangible products, the patent is not granted on the idea but on the tangible object itself, so that the ideas themselves are not monopolized except in the limited tangible form in which they are embodied in the machine or manufactured product.

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107. For a more extensive discussion of this question, *see* Brief *amicus* for the American Patent Law Association, pp. 7-10.

This Patent Office statement completely contradicts the Patent Office's red herring argument (Pet. Br. 36, n. 28) that the "effect of a machine patent would be even broader than that of the process patent." *See* also *Waxham v. Smith*, 294 U.S. 20 (1935): One "does not avoid infringement of [patentee's] *method* patent merely by employing it in a machine of different structure than [patentee's]" (emphasis added) and *Benson*, *supra*, 69-70, quoting a similar statement with approval from *Cochrane v. Deener*, 94 U.S. 780.

Thus, the entire approach of petitioner in this case has been not to deal with the merits of respondent's invention as a machine, but instead to wishfully designate it an "idea," a "use" and a "new use" or a "method of doing business" so that it can be challenged as an unpatentable abstraction. It is clear from the claims that respondent defines his invention as a machine; it operates as a machine; it provides a machine solution to a machine problem and produces an end result that only a machine can produce; for as the court below found (Pet. 13A) "nor can we imagine how [the apparatus operations] could be realistically performed by a human being." Calling this invention an "idea" scores of times does not change its physical character, but such an obfuscatory attempt to convert a "machine" into the abstraction of a "process" to prevent the proper application of the patent law is precisely what this Court condemned in *Burr v. Duryee*, *supra*, at 577:

> In this case we have an attempt to convert an improved machine into an abstraction, a principle or mode of operation, or a still more vague and indefinite entity often resorted to in argument, an "idea." Those who use the latter term seem to have no fixed idea of what they mean by it. But it may be used . . . successfully to mystify a plain matter.

Petitioner's case against the patentability of all programmed computers is similarly fabricated by desig-

nating them all as "ideas" rather than by analyzing their structure as machines. Not only is there no authority for removing any part of a machine from patent protection by reason of the manner in which it is constructed, it violates the clear mandate of Congress that there be no such exclusions. The enormity of petitioner's request for an adverse Court ruling on computer programs is that it would exclude the most complex technology known today from the patent system.

III. Equal Protection Requires that Respondent's Machine Invention Be Given the Same Patent Protection Afforded any New and Unobvious Machine.

Petitioner's classification of a softwired special-purpose computer such as respondent's invention as non-patentable subject matter lacks any rational basis in fact; hence, it violates respondent's equal protection rights under the Fifth Amendment.[108] Respondent may not be denied patent protection for his machine invention solely because it is software-embodied absent some rational basis for the discrimination, *see Morey v. Doud*, 354 U.S. 457, 465 (1967). In that case the Court found arbitrary, and therefore unconstitutional, legislation which exempted the American Express Company from requirements imposed on all other vendors of money orders. The same sort of arbitrary economic favoritism condemned in that case is at the heart of the denial of patents to inventors of software-embodied special-purpose computers while granting patents to inventors of hardware-embodied special-purpose computers.[109]

108. While the Fifth Amendment does not contain an explicit Equal Protection clause, Equal Protection standards applicable to the Federal Government have been incorporated into the Due Process clause of the Fifth Amendment. *See Richardson v. Belcher*, 404 U.S. 78, 81 (1971); *Bolling v. Sharpe*, 347 U.S. 497, 499 (1954).

109. Three different comparisons describe the discrimination against software. First, the Commissioner would grant a patent on the hardware embodiment of a particular special-purpose computer but not on the equivalent software embodiment of the very same machine. Second, the Commissioner would grant patents for the innovative machine products of the hardware manufacturers but not the innovative machine products of their competitors, the small software companies (see ADAPSO and ADR Briefs *amici* herein). Third, while machines as a class are patentable, 35 U.S.C. §101, the Commissioner has singled out software-embodied machines and no others as unpatentable. These discriminations are all predicated on a myth of the non-machine—the bald assertion that a machine constructed with software is an "idea" in direct conflict with the rulings of the Court; *Burr v. Duryee*, *supra*.

The instant case is even stronger than *Morey v. Doud* because the patent statute is by its terms generally inclusive.[110] This is not a case in which great deference need be given a studied intentional congressional act of exclusion since there was none. To the contrary, the patent policy urged by the Government here violates the Small Business Act[111] in that it discriminates against the small businesses which form the heart and core of the software products industry. Such an inconsistent action by the Government should certainly be predicated upon a sound legal basis rather than a Luddite[112] policy of

110. "[W]hoever invents . . . *any* new and useful . . . machine . . . may obtain a patent therefor. . . ." 35 U.S.C. §101 (emphasis added). The only exception from patentability of a specific machine technology is that of atomic weapons; see 42 U.S.C. §2181; but Congress otherwise provided for incentive compensation 42 U.S.C. §2187(b), (3). There Congress made explicit the exception, reinforcing its mandate that all other machine technologies were intended to be patentable subject matter.

111. 15 U.S.C. §631, provides: "It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small-business concerns in order to preserve free competitive enterprise . . . and to maintain and strengthen the over-all economy of the Nation."

112. "We are probably now at about the comparable point in time in the Computer Revolution to that in the Industrial Revolution when the Luddites were vainly smashing equipment." H. H. Goldstine, *supra*, p. 347. For the last decade and more, there have been hysterical arguments raised against the patenting of software-embodied inventions. First Amendment questions raising the

opposing technological advances. No judicial sanction should be given a strained administrative interpretation that runs counter to the clear import of the statute. While an action of the Commissioner that is consistent with an explicit congressional directive is entitled to deference, when he acts on his own discretion and without congressional support, "a very different question is presented." *Boyden v. Comm'r. of Patents*, 441 F.2d 1041, 1044 (D.C. Cir. 1971).

The Commissioner of Patents offers no justification related to the purposes of the Patent Act for his classification of software inventions as unpatentable. He does not deny that all machines are patentable subject matter. Instead, the petitioner defends the discrimination with the bald mischaracterization of the programmed general-purpose computer as an "idea" and not a new machine. This strained unrealistic attempt to rule out an entire machine technology from the patent laws cannot withstand scrutiny. While there is much verbiage in the petitioner's brief that disparages the machine nature of programmed general-purpose computers, he has not presented one bit of supporting evidence to any tribunal in this case.[113]

Note 112—*Continued*

spectre of complete computer domination, panicked fears of the undermining of the patent system, concocted theories of machines being "ideas" and of administrative convenience, have been among the many short-lived stratagems put forth to deny recognition to the uncontrovertible advances of software technology. Must we be so fearful of humankind's ability to utilize technology beneficially that it is necessary to stonewall against further technological advancement by denying its existence and discouraging its forward thrust.

113. The C.C.P.A. has long held that programming a general-purpose computer structures the computer into a different machine. The Board of Appeals so ruled in respondent's favor in this case (Pet. 28A) holding that the invention is a machine. Petitioner is barred by the patent statutes on appellate jurisdiction from contesting that finding here (see Section I, *supra*).

When the Patent Commissioner singles out for exclusion the economically struggling segment of the data processing industry, and has favored the "economic" interests of the "collective forces of major hardware (i.e., computer) manufacturers and their representative associations,"[114] judicial protection against unjustified discrimination is especially necessary. That this is so, is made painfully clear by the monopoly conditions which exist in the computer industry and which the Government admits has proved so harmful to the software products industry and to our national interests (see ADAPSO Brief herein, "The Absence of Competition in Software," p. 3, *et seq.*). In *Dukes v. New Orleans*,[115] the court, quoting *Morey v. Doud, supra*, held that favoritism of a particular segment of an industry without apparent reason is discrimination of "unusual character" requiring "careful consideration." 501 F.2d at 710. Although giving great deference to governmental actions in the economic sphere, no rational basis was found to support the discrimination in that case, and it was struck down as unconstitutional.[116]

The form of construction of a special-purpose computer — with hardware or software — bears no relationship to the patent law or any other legitimate government interest. The "useful Arts" are promoted equally by hardware and software patents. In fact, the exclusion of soft-

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114. Judge Rich's dissent below, Pet. 20A.

115. 501 F.2d 706 (5th Cir. 1974), appellee's motion to proceed *in forma pauperis* granted, 95 S.Ct. 1556 (1975). In that case, an ordinance which banned food vendors from New Orleans' Old Quarter unless they had been in operation for 8 years was struck down as unconstitutional since the classification bore no rational relationship to any legitimate state interest.

116. *See Pavone v. Louisiana State Board*, 364 F.Supp. 961 (E.D. La. 1973), *aff'd*. 505 F.2d 1022 (5th Cir. 1974) (one licensed to cut only women's hair could not be prohibited from cutting men's hair since there were no relevant differences between the two); *Bolton v. Texas Board*, 350 F.Supp. 494 (N.D. Tex.), *aff'd*. 409 U.S. 807 (1972).

ware patents has had a severely detrimental effect on the functioning of the patent system. Since hardware and software can be alternative embodiments of the same machine structure, it is necessary to conduct a search of the prior software art to determine whether a particular hardware invention is novel.[117] The lack of software patents means that there have been inadequate search facilities for hardware.[118]

Different treatment based on irrelevant distinctions is unconstitutional, *Mayhue v. Plantation*, 375 F.2d 447 (5th Cir. 1967).[119] In this case, since invention can take

117. The 1966 Report of the President's Commission on the Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess.; p. 21) reflected the inaccurate and one-sided view of the hardware manufacturers that the software state of the art is irrelevant to hardware. It is to be regretted that the President's Commission permitted itself to be used as a vehicle for the dissemination of this technologically unsound point of view. Much of the innovation in hardware was and still is first achieved in software. Software prior art is as essential as the hardware prior art to adequate examination of the novelty of a hardware-implemented invention. Similarly, both are needed for examination of an equivalent software-implemented invention.

118. Delinquent in its duties for many years, the Patent Office finally in 1972 "initiated a pilot program, with the cooperation of the Bureau of Standards, to develop techniques for classification and searching of the computer programming art." (*See* Pet. Br. *Benson*, p. 31). Since no longer is the argument being raised by the Patent Office about inadequate search facilities, one must conclude that the problem has been solved. The tragedy is that so-called "search facilities" were permitted to become a problem at all. Only the hardware manufacturers benefitted during the interim period because it meant that the Examiners were being deprived of the proper research facilities to evaluate the so-called "hardware" inventions, thereby seriously undermining the entire credibility of the patent system. Fortunately, the Patent Office has apparently, albeit belatedly, taken corrective action.

119. An ordinance establishing longer hours during which taverns could sell liquor for off-premises consumption than could package stores was struck down since the nature of the selling establishment was irrelevant to the state's purpose of regulating sale of liquor for off-premises consumption.

place equally in hardware and software (the choice of construction often being a matter merely of "trade-offs") and since the two embodiments are technologically equivalent, both most be treated identically for purposes of the patent law.[120]

The Government's suggestion of alternative modes of protection for software innovations, such as trade secrets or copyrights,[121] are inadequate and inappropriate to the task, and destructive of the constitutional purpose of the patent system as an incentive to machine innovation.[122] There is no evidence of any intent of Congress to relegate software inventors to reliance on other means of protection.

Copyright protects particular expression, not machine structure. There is no requirement of innovation, only originality; therefore, a copyright would not protect the machine configuration that is at the heart of respondent's invention. The fact that a "program" can be represented as a list of computer operations is no more significant than the fact that a radio circuit can be represented in a schematic diagram. An innovative radio circuit would not be protected by a copyright on a drawing and the special-purpose computer that is respondent's invention would not be protected by a copyright on a program listing.

120. *See American Trust Co. v. South Carolina State Board*, 381 F.Supp. 313 (D.S.C. 1974) holding that all domestic corporations, whether controlled by local or out-of-state interests, were equally competent to serve as executors and administrators, hence, discriminatory statute against out-of-state interests was unconstitutional.

121. Here, too, with respect to copyrights, the 1966 President's Commission allowed itself to be used as an instrument to becloud the issue. The recommendations of the 1966 President's Commission seeking to deny patentability to software-implemented inventions were soundly rejected by Congress; see H.R. 5924, proposed, 35 U.S.C. §106, 90th Cong., 1st Sess. (1967).

122. The "poor-quality software" that presently exists and the need for the incentive of the patent system is described in the ADAPSO Brief herein, pp. 6-11.

Trade secrecy is not only inadequate, but forced reliance on it violates the patent policy of disclosure which is needed to advance the "useful Arts". To the inventor, it is burdensome and often impossible to assure the complete secrecy that is required to retain the value of the innovation. Beyond this, reliance on this mode of protection has the counterproductive effect, opposed by public policy, of deterring disclosure of software innovations, hence, inhibiting the progress of the "useful Arts." Neither trade secrecy nor copyright is a substitute for equal treatment under the patent law.

In sum, the petitioner's arbitrary refusal[123] to grant patents for software inventions, in addition to violating the clear command of the statute, is a deprivation of the inventor's equal protection rights. The petitioner admits that all machines are patentable subject matter and offers no rational reasons for excluding the software machine technology. All the evidence establishes conclusively that respondent's software invention is a new machine. The Board of Appeals so found and the Commissioner, petitioner herein, is bound by that ruling. Petitioner's only answer to the equal protection dilemma is the bald assertion that the invention is a "use" not a machine. Without any evidentiary support, contrary to the views of both the Board and the C.C.P.A., and not jurisdictionally before this Court, that assertion cannot justify nor sustain an unconstitutional Patent Office policy of wholly irrational and unequal treatment.

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123. In 1968, the then-Commissioner of Patents stated: "The present Office policy of refusing patents in this [computer program] field has acted as a strong deterrent to the filing of applications." (Commissioner Brenner, *supra*, p. B-12) By its action, the Patent Office acted legislatively in opposition to the patent statutes and to the Small Business Act. While the most direct sufferers of this Patent Office policy are the software products companies engaged in innovative machine building, it is a fact that the loss is suffered by the whole nation which is deprived of the knowledge that would be disclosed to it by the award of a patent.

IV. Respondent's Machine Invention is Unobvious in View of the Prior Art.

Both tribunals below found that respondent's invention is a "new machine"; the remaining question is whether this machine considered "as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art . . ." 35 U.S.C. §103. The test of obviousness requires that the differences between respondent's claimed invention and the prior art be considered to determine "obviousness or unobviousness." *Graham v. Deere, supra.*

The Patent Office relies on two prior record-keeping machines as prior art in this case. It concedes by its silence that neither of the alleged prior machines is concerned with the specific machine problem of providing an automatic record-keeping machine that would enable a large number of small users to get the benefit of large-scale electronic computer equipment and still continue to use their individual ledger format and bookkeeping methods. Respondent's machine achieves that end result—the alleged prior machines do not, and the Patent Office does not suggest that they do.

The patent claims (Pet. 5A) call for an automatic record-keeping machine which has two sets of controls, as the C.C.P.A. found, (Ibid.) "a master control" and "a general control." The latter functions as a slave to the master controls, which contain the controls for all of the variations in ledger formats and bookkeeping methods that may exist from one user to the next. The general controls contain the controls that are common to the various users; they configure the circuits to identify the particular master controls in the data filed and perform the combinations of operations called for by the master. The master controls are retained in the date files so that they can be changed easily as though they were data. By this construction and the "dynamic interrelationship" (Br.

Pet. 36) between the two sets of controls all the variations in control can be built into the machine without the expense and difficulty of designing a general control for specifically processing each variation in ledger format.[124]

The claims call for the entire context of a special-purpose computer, including input and output devices, a memory, a processor and the interrelated master and general controls for performing the specific record-keeping operations, so that the machine adapts to whatever variations in ledger format a user may specify. Thus the combination of elements defined by the claim is that of a completely automatic machine for performing the record-keeping.

The C.C.P.A. found that the alleged prior machines are not concerned with the same machine problem nor have they arrived at respondent's machine solution; they

> "simply are not suggestive of the subject matter of the appealed claims." (Pet. 16A)

Neither of the prior machines remotely suggests the two sets of interacting controls that are at the heart of the respondent's invention. For example, as the C.C.P.A. pointed out (Pet. 13A), "the claimed *apparatus* automatically performs the identifying operations." This "means for identifying," as set forth in the claims, is the control mechanism of the general controls that interacts with the master controls to carry out the control operation called for by the master controls.[125]

124. Petitioner's summary of claim 20 omits all mention of these controls and their interrelationship; this summary (Br. Pet. 5) is inaccurately presented in indented format as though a quotation.

125. It is clear from Dirks that his machine system employs a uniform format of programming, with the location of all of the items of data being pre-arranged, *i.e.*, "the data is recorded in sequence in a track and is therefore readily accessible. . . . The program has merely to direct addition or subtraction." (A. 106, col. 26, lines 41-3). This is in direct contrast to respondent's system, in

The Patent Office nowhere suggests: (a) that either of the alleged prior systems is constructed in the same way as respondent's machine, *inter alia*, with the same combination of controls; nor (b) that either would operate in the same way as respondent's machine with the controls interacting to adapt to each user's ledger format; nor (c) that either would produce the same end result of respondent's machine of processing the financial records of large numbers of small users each with an individual ledger format.

The Board of Appeals' discussion of the resemblances between its proposed modification of a prior machine and respondent's is limited to a discussion of the use of "category codes" on the checks and deposit slips and in the ledger.[126] Respondent does not rely on the novelty of "category codes" for patentability; nor on the "meaning" of the coded machine signals.[127] The Dirks' machine could be constructed with "category codes" to identify the various categories of records and any desired meanings can be assigned to the signals, but it would not be the same machine as defined in the claims. Such a modification of Dirks would neither infringe the claims nor would it anticipate the claims. For even if the alleged prior machines contained the asserted category codes, they nevertheless would not have the two sets of interacting controls, nor would they provide a machine which would automatically keep records for a large number of individual users having different ledger formats and bookkeeping records. They would not be

which the circuits first identify what types of operations are called for by the user's ledger format in the master controls. These latter controls are directly associated with the data on which the operations are to be performed, so that the data is intermixed with controls and not "recorded in sequence" as in Dirks.

126. Judge Markey's dissent acknowledges that respondent's invention is not disclosed in the prior art and, his dissent is likewise limited to the question of whether "category codes" would be obvious.

127. *See* n. 86, *supra*.

multi-format machines, and especially not respondent's claimed adaptive multi-format machine.

The Dirks machine is cited by petitioner (Pet. Br. 40, n. 33) to suggest that a machine is there disclosed which is usable for "networks of individual departments of a large business corporation" and for "personalized files." Dirks' solution to his problem is to provide a separate computer for each department (A. 97, col. 7, lines 57-61):

> . . . to provide a complete satellite system of smaller personalized computers, in which a group of *smaller* computers cooperate with each other in a wire *network* for the exchange of data required at other places. (emphasis added)

The users served by respondent's invention are too small to afford even one of Dirks' "smaller computers." The use of a separate general program for each user's own ledger format was not a satisfactory solution to the machine problem confronted by respondent. Certainly, Dirks' use of a separate computer for each user is even less satisfactory (though it may be quite satisfactory for Dirks' problem of processing data for a multi-department corporation). Clearly, the claimed record-keeping machine herein is not even remotely suggested by Dirks.

The Patent Office, by pulling out of the Dirks patent various words, phrases and sentences, seeks to find in Dirks resemblances to respondent's system. This technique of misapplication of the Dirks patent to the claims was rejected out of hand by the Court below (Pet. 16A):

> We find that, with appellant's specification before them, the board and solicitor have merely chosen various portions of the Dirks apparatus and have attempted to read them upon various elements set forth in appellant's claims.[128]

Accordingly, respondent's invention is constructed differently, operates differently, and produces a different end result; the prior art is, as the C.C.P.A. found, "simply not suggestive of the subject matter of the appealed claims" (Pet. 16A). Essentially, the only resemblances between the alleged prior art and that of respondent are that they are both record-keeping machines. The differences are substantial differences and the invention considered as a whole is clearly not *obvious*. *Graham v. Deere, supra.*

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128. With that technique, petitioner's searching (Br. Pet. 41) through the Dirks patent (respondent has deposited with the Court complete copies of the Dirks patent in a full-size type face) has come up with a sentence stating that in the Dirks system "programming is very easy and different programs are very easily coordinated." Dirks does not explain what programs are "coordinated" nor for what purpose, whether it is coordination among satellite computers or coordination performed by a programmer in designing the programs. Dirks clearly does not disclose the claimed two sets of controls with the interacting master and general controls. Respondent's invention makes it unnecessary to construct separate programs for the master controls, while Dirks requires separate programs for each of the "network" of "smaller computers."

CONCLUSION

Petitioner is jurisdictionally barred from raising herein the "new use" which underlies the Patent Office opposition to the patentability of programmed general-purpose computers. In any event, the decision below should be affirmed for the reasons set forth above both as to the patentability of respondent's programmed computer as a machine and as to its unobviousness over the prior art.

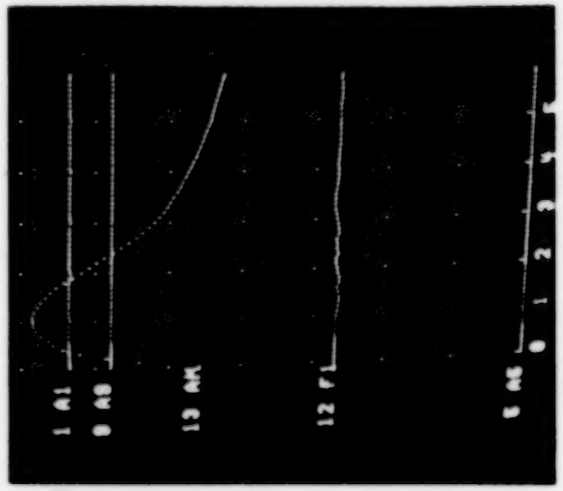
Respectfully submitted,

MORTON C. JACOBS
Attorney for Respondent

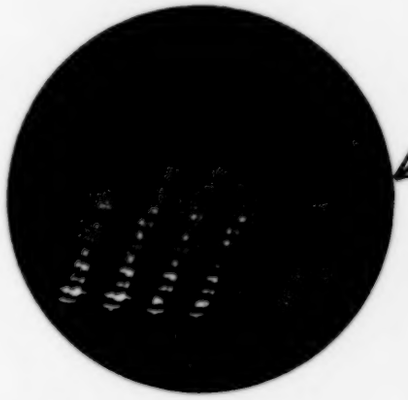
Of Counsel:
RALPH A. JACOBS

APPENDIX

TECHNOLOGY REVIEW, MASSACHUSETTS INSTITUTE OF TECHNOLOGY VOL. 72, pp. 18, 19, MAY 1970.



M.I.T.'s Walter D. Bilofsky uses a PDP-9 computer adapted for sound synthesis and analysis. He is shown using a program, of his own design, for the construction of a musical score, which the computer plays using sounds designed with the help of a second, sound-specification, program. At right is the visual output of this program, which enables the composer to edit the characteristics of his chosen sound. (Photos: Don Estes)



La Machine Infernale

Music by Computers
Heinz Von Foerster, James W. Beauchamp, editors
New York, John Wiley & Sons, Inc., 139 pp., $14.95

Reviewed by
Stephen W. Smoliar
Department of Mathematics, M.I.T.

This book is a collection of papers and sample recordings presented at the 1966 Fall Joint Computer Conference in a session entitled "Computers in Music" organized by Heinz Von Foerster.

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JUL 21 1975

IN THE

Supreme Court of the United States

OCTOBER TERM 1974

No. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS & TRADEMARKS,

Petitioner,

v.

THOMAS R. JOHNSTON,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

---

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE AND BRIEF AMICUS CURIAE FOR THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

JOHN S. VOORHEES
KENNETH E. KROSIN
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

Counsel for
Computer & Business Equipment Manufacturers Association (CBEMA),
Amicus Curiae

Of Counsel:

HOWREY & SIMON
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

WILSON - EPES PRINTING CO., INC. - RE 7-6002 - WASHINGTON, D. C. 20001

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v.

THOMAS R. JOHNSTON,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

---

MOTION FOR LEAVE TO FILE BRIEF AMICUS CURIAE

The Computer & Business Equipment Manufacturers Association (CBEMA) respectfully moves for leave to file the attached Brief Amicus Curiae in the above-entitled case. Petitioner has consented to the filing of this brief. The consent of respondent was requested but refused.

This Court granted CBEMA's motion for leave to file a brief as Amicus Curiae in support of the Petition for the granted Writ of Certiorari in this case.

CBEMA is the trade association which, along with its predecessor association, the Business Equipment Manufacturers Association, has represented the computer and business equipment industry for the past 59 years. The companies comprising the current CBEMA membership include the nation's leading manufacturers of computers, business equipment and related products. While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical character readers, addressing machines, accounting machines, bookkeeping machines, mail handling equipment, duplicating machines and office copying machines. CBEMA is also the approved sponsor under the American National Standards Institute (formerly the American Standards Association) for the establishment of domestic and international standards related to information processing, computers and office machines.

Members of CBEMA have consistently been leaders in achieving major developments, in both the concept and application, of computer programming and data processing, and have contributed greatly to the present significant status and role of the computer in modern society. These members maintain and support extensive activities devoted to applied research and systems development in all phases of computer use and data processing.

Not only is the subject matter of the present suit of vital concern to manufacturers in the computer and data processing field, it is also of vital concern to the Government and to the public generally. The resolution of the issues squarely presented in this case will affect the development of the data processing industry in the United States and will have an impact on those segments of our society which use and receive the benefits of technological advances in this industry.

CBEMA believes that, because of its extensive background in computer hardware and software, it is in a position to present a unique point of view not likely to be covered by the Solicitor General.

Accordingly, CBEMA respectfully requests that this Court grant leave to file the attached Brief Amicus Curiae.

Respectfully submitted,

JOHN S. VOORHEES
KENNETH E. KROSIN
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

Counsel for
Computer & Business Equipment
Manufacturers Association
(CBEMA),
Amicus Curiae

Of Counsel:

HOWREY & SIMON
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

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---

BRIEF AMICUS CURIAE FOR THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION (CBEMA)

I

QUESTIONS PRESENTED

1. Whether subject matter which is not patentable under 35 U.S.C. § 101 becomes patentable if a general purpose computer is programmed to perform the non-patentable subject matter.

2. Whether an existing general purpose computer programmed to perform a financial accounting procedure comprises patentable subject matter under 35 U.S.C. § 101 when claimed as a "machine system".

II

INTEREST OF THE COMPUTER & BUSINESS EQUIPMENT MANUFACTURERS ASSOCIATION

This brief Amicus Curiae is submitted by the Computer & Business Equipment Manufacturers Association (CBEMA) in accordance with Rule 42(2) of this Court. Petitioner has consented to the filing of this brief. The consent of respondent was requested but refused.

This Court granted CBEMA's motion for leave to file a brief as Amicus Curiae in support of the Petition for the granted Writ of Certiorari.

CBEMA is the trade association which, along with its predecessor association, the Business Equipment Manufacturers Association, has represented the computer and business equipment industry for the past 59 years. The companies comprising the current CBEMA membership include the nation's leading manufacturers of computers, business equipment and computer-related products. While product lines of member companies vary widely, the following list is illustrative: electronic computers, computer software including programs, computer input and output devices, computer storage devices, support services, data transmission equipment, optical character readers, addressing machines, accounting machines, bookkeeping machines, mail handling equipment, duplicating machines and office copying machines. CBEMA is also the approved sponsor under the American National Standards Institute (formerly the American Standards Association) for the establishment of domestic and international standards relating to information processing, computers and office machines.

Members of CBEMA have consistently been leaders in achieving major developments, in both the concept and application, of computer programming and data processing, and have contributed greatly to the present significant status and role of the computer in modern society. These members maintain and support extensive activities devoted to applied research and systems development in all phases of computer use and data processing.

CBEMA does not have any direct or indirect interest in the *Johnston* patent application. As Amicus Curiae herein, CBEMA has a deep interest in the proper resolution of the legal questions raised in this case and the profound impact of this decision will have upon the data processing industry and the public it serves.

Not only is the subject matter of the present case of vital concern to manufacturers in the computer and data processing field, it is also of vital concern to users of computer equipment, including the Government, and the public generally. The resolution of the issues presented in this case will affect the development of the data processing industry in the United States and will have an impact on those segments of our society which use and receive the benefits of technological advances in the industry.

This brief outlines the difficulties and uncertainties in the development and use of computer programs which will follow if the Lower Court's decision is affirmed, as well as the social, economic and practical implications of any holding that computer programs of the type sought to be patented in this case are patentable subject matter. It is CBEMA's position that the majority of the Lower Court misconstrued this Court's holding in *Gottschalk* v. *Benson*[1] concerning patentable subject matter.

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[1] 409 U.S. 63 (1972).

III

THE NATURE OF THE COMPUTER AND COMPUTER PROGRAMS

The computer enhances and extends man's problem solving capacity by providing more powerful methods for calculating, storing, organizing, structuring, retrieving and manipulating large amounts of information in the form of data. Fundamentally, the computer expands the ability of man to use his intellectual capacity.

A general purpose digital computer may be described in the following manner. The machine has input and output units which accept and deliver data; a memory which holds or keeps data in addressable locations; a computer unit which performs various arithmetic and logical operations upon the data; and a control unit which controls the operations and coordinates the activities of the other units. A program of instructions for operating the computer is stored in the memory and during operation of the computer directs the control unit to cause the various other units to perform their operation in a designated sequence to obtain a useful result. The data or instructions are manifested in these various units by electrical pulses or states. Each of these units contains devices for manipulating or handling the electronic pulses.[2]

Although a computer is capable of handling a large variety of problems, the number of basic operations it can perform (adding, subtracting, multiplying, dividing, comparing, shifting, storing and the like) is limited.

[2] For a general discussion of how a computer operates, *see* "Protecting Proprietary Rights of Computer Programs: The Need for New Legislative Protection," 21 The Catholic Univ. L. Rev. 181 (Fall 1971).

Every computer can operate solely in accordance with the directions it is given. These directions are contained in computer programs and instruct the computer how it should manipulate and compare data in accordance with an algorithm, which is simply a step-by-step procedure for accomplishing a desired result. For example, the algorithm may be a mathematical formula, a method of doing business, or an expression of a scientific principle or law of nature.

A computer program is a set of instructions to a computer as to how it should manipulate data.[3] The computer program may direct something as simple as adding two plus two, or as complex as determining the proper course for a manned flight to the moon. In solving such problems, the computer can only function in accordance with the algorithm used by the programmer for solving the problem.

A computer program is created in the following manner: A programmer first develops an algorithm which sets forth in broad terms the desired mathematical principles or logical sequences to be used in solving the problem.[4] The next step in the process is the development

[3] A computer program is often described as either a "systems" or "applications" program. A systems program is normally developed by the computer manufacturer. It is designed as an integral part of the computer and functions in a housekeeping capacity for the many specific types of jobs to be performed. On the other hand, an applications program merely utilizes an existing computer as a tool to solve a particular problem. An applications program does not give rise to new system functionality or result in changes in the computer provided by the manufacturer. A large number of applications programs are developed by the various computer users. Respondent's program is a prime example of an applications program because it is addressed to solving a problem external to the computer system where the computer is simply being used as a tool to perform the financial banking algorithm sought to be patented.

[4] An algorithm is often expressed in a written flow chart, which is not hardware. See Figures 1A through 9C of the *Johnston* patent application. (Pages 277-291 of the record below).

of a detailed set of instructions which the computer follows in carrying out the algorithm. This set of instructions is a computer program. In devising the algorithm and in preparing the program it is not necessary to be knowledgeable about the computer's internal workings or how it actually handles and manipulates the data received. Given a particular algorithm, the programmer takes the limited number of fixed operations which a computer is capable of carrying out and arranges these operations in a sequence so that the desired algorithm is implemented. Once the algorithm has been established, any programmer can program a general purpose computer to perform the steps of the algorithm.[5]

An appropriate analogy is often considered to be found in the way in which a player piano operates. The piano has a mechanism for automatically operating its keys according to the instructions contained in a punched paper piano roll. A given musical composition can be automatically played on the piano by simply punching holes in the piano roll so that the keys will play the musical notes called for by the composition. The piano and its control mechanism are designed in such a way that it is able to perform any musical composition whose notes are recorded in the piano roll.

The algorithm upon which a computer program is based is the equivalent of the musical composition in the player piano analogy, and the series of machine instructions used to implement the algorithm in a computer program are analogous to the instructions punched into the paper piano roll. In both instances, the second step amounts to nothing more than a set of instructions for the machine (*i.e.*, computer or piano) automatically to implement the steps contained in the algorithm or musical composition. Such creativity as exists lies solely in the development of the algorithm or musical composition, and any patent issuing thereon would necessarily be grounded on the algorithm or musical composition.

[5] *See* discussion of basic elements of computer programming in Breyer, "The Uneasy Case for Copyright: A Study of Copyright in Books, Photocopies, and Computer Programs," 84 Harv. L. Rev. 281, 340-51 (1970).

Respondent advocates that a computer is a warehouse of unrelated parts and that a program applied to such a computer creates instant hardware from these unrelated parts which may be claimed as a machine system. A computer is not a warehouse of unrelated parts, any more than is a player piano. This warehouse-of-unrelated-parts concept finds no basis in fact and is strictly a vehicle to support the patenting of non-patentable subject matter.[6]

IV

ARGUMENT

A. The Holding By The Lower Court Conflicts With This Court's Holding In *Gottschalk* v. *Benson*

In *Gottschalk* v. *Benson*,[7] this Court held that a mathematical process for converting binary-coded-decimal numerals into pure binary numerals, which had been embodied in a computer program for use in a general purpose digital computer, was not a patentable process within the meaning of 35 U.S.C. § 100(b). By so holding, this Court explicitly recognized that granting patent protection to the computer programming process would, in effect, provide such protection to the algorithm itself. Thus, the Court looked to the substance of the claimed

[6] The United States Patent & Trademark Office has granted patents on computers and player pianos as machine combinations which would not have been granted if, in fact, they were only a "warehouse of unrelated parts."

[7] 409 U.S. 63 (1972).

invention—a mathematical algorithm—and determined that the contribution was non-patentable subject matter under the patent laws.

In the decision below in this case, the Court of Customs and Patent Appeals held that a general purpose computer programmed with a financial banking procedure and claimed as a new "machine system" is patentable subject matter under 35 U.S.C. § 101.[8] That holding focuses on the form of the claims presented to the Court, however, and does not look, as did this Court's holding in *Gottschalk* v. *Benson*, to the substance of the alleged contribution. Respondent has not devised a new "machine system" in the sense of combining hardware elements. A review of the record shows that no machine has been invented in this case or disclosed in respondent's patent application[9] and that respondent's real contribution is a financial banking algorithm implemented on a general purpose computer. This is conceded by respondent, who admitted in his brief before the Court of Customs and Patent Appeals that "the invention is being sold as a program to banks" and was "reduced to practice in the software form of computer programs. . . . ."[10]

Financial banking procedures are methods of doing business which, like mathematics, plans of action, scientific principles, ideas, laws of nature, etc., historically have been considered non-patentable as a matter of public policy. Thus, even if respondent had disclosed a hardware implementation for his non-patentable algorithm,

[8] The Lower Court's Opinion is reported at 502 F.2d 765 (C.C.P.A. 1974).

[9] For example, the so-called "control system" disclosed in respondent's patent application is not hardware but simply applications program routines for manipulating bank account data.

[10] *See* page 18 of respondent's brief before the C.C.P.A. and Judge Rich's dissent, 502 F.2d at 773.

it should not be patentable if claimed so broadly as to provide patent protection for the algorithm. Unless this Court holds respondent's application program unpatentable, it would be possible simply to disclose an obvious hardware implementation for the algorithm, such as a general purpose computer, as a basis for effectively obtaining patent protection for the algorithm.

This Court should not sanction any procedure for patenting non-patentable subject matter. Thus, where a computer program is predicated upon a non-patentable algorithm, the program should not be patentable as a "machine system" even if it coacts "synergistically" with the computer.[11] In the instant case, however, the Court need not address the concept of synergism since none exists. The computer is simply being used as a tool to perform the financial banking algorithm developed by respondent.

The holding below has created an improper extension of the patent system by providing patent protection (1) for a non-patentable algorithm, (2) implemented as a computer program, (3) for use in a general purpose computer, and (4) claimed as a "machine system". Thus, the Lower Court has explicitly approved a procedure to patent indirectly subject matter which could not be patented directly.[12]

If semantic distinctions are set aside for purposes of determining whether the claimed inventions are drawn to patentable subject matter, the "machine system" in the instant case is in the same category as the mathematical "process" in *Gottschalk* v. *Benson*. In both cases,

[11] This is a requirement for patentable combinations established by this Court. *See Andersons-Black Rock* v. *Pavement Salvage Co.*, 396 U.S. 57 (1969).

[12] *See* this Court's recognition of the admonition by the President's Commission on the patent system regarding patenting indirectly subject matter which could not be patented directly. 409 U.S. at 72.

they are simply computer programs for performing algorithms, which are not patentable subject matter. This was recognized in the dissent below, where it was observed that every competent patent draftsman can write process claims in machine system form.[13]

The determination whether the disclosed invention constitutes patentable subject matter must be made by examining the *substance* of the discovery, rather than the *form* in which it is claimed. The patentability of respondent's claims must be judged in the light of his actual contribution—a financial banking algorithm embodied in a program for a general purpose computer. When the substance of the invention is considered, the result of the Lower Court's decision conflicts with this Court's holding in *Gottschalk* v. *Benson*.[14]

B. Policy Considerations Opposed To The Availability Of Patents For Computer Programs Of The Type Contained In This Case

1. *The Computer Industry Has Developed In An Atmosphere Of Free Interchange Of Computer Programs*

In two decades the computer industry has become a major and substantial factor in our economy and now impacts virtually all segments of society. When computers were first used commercially less than twenty-five

[13] 502 F.2d at 773.

[14] This Court found claims in product form improper because they, in effect, covered non-patentable subject matter in *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948). *See also O'Reilly* v. *Morse*, 56 U.S. (15 How.) 62 (1853); *Armour Pharmaceutical Co.* v. *Richardson-Merrell, Inc.*, 396 F.2d 70 (3d Cir. 1968); *Davison Chemical Corp.* v. *Joliet Chemicals, Inc.*, 179 F.2d 793 (7th Cir. 1950); *Templeton Patents, Ltd.* v. *J. R. Simplot Co.*, 336 F.2d 261 (9th Cir. 1964). Substantively, respondent relies on non-patentable algorithmic functions in the claims to support patentability of components found in every general purpose computer. The effect is to claim the algorithm.

years ago, a number of respected businessmen, scientists and public officials believed that the ultimate need for such highly sophisticated devices would be limited to a few dozen systems. In fact, the uses and applications of computers have increased beyond the most extravagant earlier projections, and by 1974, over 255,000 computer systems made by American-based companies were reported to be in use, with a cumulative value of $54.1 billion.[15] This rapid growth will continue over the next few years and it has been estimated reliably that by 1979, there will be over 886,000 American-made computer systems in use with a value in excess of $99.7 billion.[16]

In the so-called programming and software side of the industry, computer users are already spending as much on software as they are on computer hardware, and the software field has itself become a multi-billion dollar subindustry.[17] The growth rate of the software field is expected to increase significantly and in less than five years

[15] EDP Industry Report, April 30, 1975, Vol. 10, Nos. 15 and 16 at p. 9. These figures are for worldwide use of computers made by American companies. In the United States alone, the cumulative value of computer systems in use in 1974 is estimated at $33.6 billion and by 1979 this figure is projected at $60.2 billion.

[16] *Id.* at p. 9. This report also states on page 1 that in 1974, total worldwide shipments for American-based companies of computers was $11.2 billion and that by 1979 total revenue will be $18.9 billion.

[17] To select an arbitrary point in time to illustrate the growth factor, in 1957 the Association for Computing Machinery had approximately 3,000 members which represented the vast majority of the working computer programmers in the United States. Some fifteen years later in 1972, it was estimated that the number of employed programmers exceeded 250,000 and by 1985 it has been estimated that there will be in excess of 640,000 working programmers. *See Expanding Use of Computers In The 70's, Markets-Needs-Technology*, 51 (Prentice Hall 1971); "Carlson Testifies on Programmer-Professional or Not," 14 Communications of the ACM 201 (March 1971), S.S.D. No. 249 S.I.L.T. Presentation at Share Meeting XLIII, p. 25 (October 15, 1974); U.S. Gov. Occupational Outlook Handbook, 1972-73 edition and 1973-1974 edition.

computer users will be spending at least twice as much on software as on computer hardware.[18] For example, it has also been estimated reliably that the gross value of software purchased and supplied in the United States in 1970 was approximately $5 billion, that in 1975 this figure should double to $10 billion, and that by 1980, it will triple to $15 billion.[19]

The tremendous growth of the computer software industry and the vast number of breakthroughs in the field of programming, which have occurred in the last two decades, have by and large taken place in a legal framework conducive to the free interchange of ideas and information. Industry experience shows that new algorithms and programming procedures, as well as specific programs, have been widely disseminated and generally exchanged. This atmosphere of intellectual freedom has contributed significantly to the enormous strides made in the use of computers.

Wide dissemination of computer programs has benefited the users of computers and the public at large. For years professional journals have published algorithms and pertinent discoveries in mathematics in order to encourage overall advancement of the "state of the art" of programming. At various seminars and symposia on computer programming, open, frank and public discussions have been held concerning newly formulated algorithms or refinements of existing algorithms, and the participants have sought to build upon and improve the overall level of knowledge in the programming field. However, if patent protection for computer programs is permitted merely by the semantic innovations allowed by the Lower Court in this case, more restrictive and in-

[18] "Towards the Computer Utility: Evolution or Revolution," *Datamation* 125 (October 1969).

[19] *See Expanding Use of Computers in the 70's, Markets-Needs-Technology*, 54-55 (Prentice Hall 1971).

hibiting information handling practices will be inevitable. In fact, certain professional journals have already taken the position that they will no longer publish allegedly novel algorithms if the person who develops them claims patent protection.[20]

Another significant consideration is that the programming industry is quite different from other industries in which patent laws have wide application. One of its unique characteristics is that almost all of the end users of programs are also creators and duplicators of programs.[21] Although there are thousands of computer systems in this country, these systems service millions of users. Many of these user organizations have large staffs of programmers who spend full time preparing new algorithms or sets of instructions for programs, and these same users characteristically spend more for computer programming services than they pay for use of the computer.

In permitting the originator of an algorithm to obtain patent protection simply by drafting "machine system" claims, the Lower Court has imposed substantial practical impediments upon all users of computers. Users will be forced to assume a major responsibility for determining potential infringement claims arising out of computer applications programs they intend to use. They will be burdened with the need to spend substantial time

[20] The Association of Computer Machinery ("ACM") has taken this position with respect to its monthly publication known as the *Communications of the ACM*. The membership of this association includes many professional computer programmers who rely upon and look to such professional journals for maintaining and improving their general knowledge concerning developments in the programming field.

[21] It is the user of a computer who often devises the applications programs, *i.e.*, the programs which adapt the computer and a general systems program to his specific uses.

and money in right-to-use searches each time a different algorithm is to be programmed on an existing computer. Some may even employ secret methods of handling computer programming information in order to prevent others from ascertaining that they may have infringed an existing patent. Adversely held patents based upon computer programs will be a constant threat to the unrestricted use of computers.

These problems are magnified in the instant case where the algorithm utilized in respondent's financial banking procedure may also be used for manipulating data in other, unrelated, areas of business and technology. This result stems from the fact that a computer is a tool which may be thought to operate on abstract ideas. For example, when performing the computations for Einstein's formula $E=MC^2$, which demonstrates the relationship between matter and energy, the computer is performing the same steps as in calculating $A=\pi r^2$, the area of a circle. If patentability depends upon the generalization of computer operations common to both equations, the effect is to patent an abstract principle unlimited to specific applications. In the instant case, respondent's claims could be construed as not specifically limited to financial banking. Thus, if respondent's claims are held to be patentable by this Court, prospective users of respondent's algorithm in other unrelated areas of endeavor could be subject to a charge of infringement.

A patent may be infringed without knowledge of the patent or intent to infringe. If computer programs were patentable either directly or indirectly as a "machine system," each user of a computer would proceed at his peril in employing the computer for his particular application. He would never know whether the algorithms in his program were specifically covered by an existing patent or were the equivalent of a claim in a patented program. Such users could be confronted with the real pos-

sibility that use of a particular algorithm would involve them in infringement litigation unless they were to pay royalties claimed by holders of patents covering allegedly comparable programs.

It is not a practical answer to say that each user could make a search to determine whether his proposed program infringed an existing patent. There is not now —and there does not appear to be in the future—any feasible way in which such searches could be made. Nor can the burden be assumed by, or shifted to, suppliers of computers who do not have responsibility for, or often even knowledge of, the precise programs employed by users of their computers.[22]

2. *Programmed General Purpose Computers Are Important To All Phases Of Human Endeavor*

Increased computer utilization stimulated, in part, by the free and open exchange of computer programs, has contributed to a substantial upgrading of the quality of life for every American. The computer has become the "engine" which assists in running our society[23] and will be able to assist man in numerous areas totally unrelated to the usual business applications for computers today.[24]

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[22] This Court recently was confronted with an analogous problem in connection with copyright infringement. In *Twentieth Century Music Corp.* v. *Aiken*, 43 U.S.L.W. 4799 (June 17, 1975), the Court held that copyright laws did not prevent the proprietor of a restaurant from freely playing his radio for the enjoyment of patrons. In reaching this conclusion the Court observed:

> First, a person in Aiken's position would have no sure way of protecting himself from copyright infringement except by keeping his radio set turned off. *Id.* at 4802.

[23] Binger, The Computer: Engine of the Eighties, *Advanced Management Journal* (January 1967).

[24] Among the many articles discussing the revolutionary impact computers will have on our society are the following: F. G. Withington, "Beyond 1984: A Technology Forecast," *Datamation*, Vol. 21, No. 1, Jan. 1975); Bjerrum, "Forecast of Computer Develop-

Some typical examples of computer uses and applications which have occurred and can occur in the next few years include the following:

Health Care

Computers are monitoring instruments and sensors in intensive care units and give an instantaneous current report of the condition of each patient in a hospital. Computers also record and analyze laboratory tests and maintain accurate medical records on all patients. They are serving communication and information links among various hospitals and individual doctors' offices and clinics, and are beginning to provide current information on many developments in the medical field. Computers are presently being utilized in assisting medical research in searching for cancer cures.[25]

Education

Computer-aided training and instruction techniques are moving from research to implementation making high quality education available to more children on an equal basis. Computers will be heavily responsible for enabling everyone, regardless of economic status, to have the advantages of higher learning. In addition, computers are being used increasingly in the world's great research

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ments and Applications 1968-2000," *Futures*, June 1969; Martino, "What Computers May Do Tomorrow," *The Futurist*, October 1969; Hammer, "Electronic Systems of Today and Tomorrow," Paper for State Department Seminar, June 1969; "What Comes Next in the Computer Age," *U.S. News & World Report*, June 1967; Diebold, "The New World Coming," *Saturday Review*, July 23, 1966; Ware, "Future Computer Technology and its Impact," *The Rand Corporation*, March 1966.

[25] McCarn and Moriarty, "Computers in Medicine," *Hospitals* J.A.H.A., January 1, 1971; "The Computer in Medicine," *Am. News*, March 2, 1970; Reilly, "Computers in Medicine," *Datamation*, May 1969.

libraries to cope with the exploding growth of recorded knowledge.[26]

Science and Engineering

Computers will continue to contribute possible further advances in science and engineering. They have already made possible this country's exploration of other planets and the Apollo Program to put a man on the moon. Scientists perform complex mathematical computations with computers and through them, have available large libraries of data for rigorous analysis. Further, utilization of computers will make possible a pushback in the frontiers of mathematics, chemistry, physics and engineering to an extent difficult to comprehend by present standards. Just one example is the search for new energy sources, which will be aided greatly by computers.

Government

Computers present unique opportunities for Government to be more effective and helpful to the average citizen. With the aid of computer programming techniques, a given problem such as pollution control or urban planning, can be simulated in terms of a mathematical model. This model can then be entered into the computer and the data manipulated to simulate actual results from the application of a proposed solution.

Legal

There are also tremendous potentials for computers to assist in relieving the nation's crowded court dockets, to collect and analyze legal documents and precedents, and to achieve better overall administration of the rapidly

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[26] *See* Computers in Higher Education, Report of the President's Science Advisory Committee, February 1967; Hansen, "Computers in Education," *The Clearing House*, December 1970, Vol. 45, No. 4, p. 195.

increasing workload of the police and law enforcement agencies.

In the case of judges and lawyers, computers are being used increasingly to assist in legal research freeing additional time for analysis. Computers also furnish invaluable assistance in collecting, summarizing and cataloging much of the factual data involved in complex litigation and other areas of the law.

Individual

It is reasonable to expect that computers will continue to present unique opportunities for the average individual in his everyday activities. In the home, computers will assist in performing such functions as food procurement, climate and lighting control as well as other home management functions. Also, computers will make it possible for individuals to obtain information needed on many subjects through point-to-point communication with a central computer or small individually-owned computers. Inexpensive electronic hand-held calculators, some of which are programmable, are already in widespread use. In a few years, computer terminals or communication devices will be just as common in homes as telephones or television sets.

3. *Because Many Countries Do Not Grant Patents On Computer Programs There May Be An Adverse Financial Impact Upon The United States Unless The Lower Court's Decision Is Reversed*

At present, many countries in Western Europe prohibit the granting of patents on computer programs. For example, in France, a statute was enacted which specifically prohibits patent protection for computer programs.[27]

[27] Article 7 of the French Patent Law of January 2, 1968. An English translation appears in Industrial Property 67-75 (BIRPI, Geneva, Switz., March 1968).

Similarly, in Germany,[28] the Netherlands,[29] and Switzerland,[30] there have been court decisions declaring computer programs to be ineligible for patents. The United Kingdom's Government has appointed a committee to examine the patent system. That committee recommended that patent protection not be available for computer programs,[31] and this recommendation has recently been reaffirmed by the British Government.[32]

Since several countries in Western Europe have decided not to extend patent protection to computer software, a serious international legal and balance of trade problem can result if the Lower Court's decision in this case is affirmed. In such case, someone in a foreign country could easily use or copy a program on which a patent has been issued in this country and have total immunity from any infringement claims under our law. Because of the availability of instantaneous communication between Western Europe and the United States, it would then be possible to use the patented program in Europe and communicate the result directly to a com-

[28] The Federal Patent Court of Germany handed down two decisions on July 23, 1974 and one decision on August 6, 1974, against computer program patenting.

[29] A decision of the Patent Office Board of Appeals on December 16, 1970, held that computer programs are not patentable under the Netherlands Patent Act, BIE No. 2, February 15, 1971.

[30] Computer programming inventions are currently considered unpatentable in Switzerland as the result of a Swiss Patent Office decision of September 3, 1968. Patent Master Und Markenblatt 68-1-53.

[31] The British Patent System. Report of the Committee to Examine the Patent System and Patent Law, Cmnd. No. 4407, at 144 (July 1970).

[32] Presented to Parliament by the Secretary of State for Trade by Command of Her Majesty (April 1975). Item 12 on page 4 includes the following statement: ". . . . There will also be a non-exhaustive list of exclusions from patentability . . . . (which) will include, amongst other things, computer programs . . . .".

puter located in the United States. Under these circumstances, the domestic patent would be rendered virtually ineffective, and the chief result would be a negative impact on our domestic economy. Among other things, such result would constitute an unfortunate and avoidable violation of United States employment and trade policy.

C. Whether Claimed As A Process Or Machine System, The Nature Of Computer Programs As A Method Of Doing Business Render Them Ineligible For Patent Protection Under The Constitution And The Patent Code

As noted in Section A, the Lower Court in this case held that a computer program may be patented under the applicable sections of the Patent Code, Title 35, U.S.C.,[33] if claimed as a "machine system". Not only does this holding conflict with this Court's decision in *Gottschalk* v. *Benson*, *supra*, but also the considered view of the United States Patent Office and the President's Commission on the Patent System.[34]

As previously explained, a computer program is a set of operating instructions for a computer and implements an algorithm which, for example, may be mathematical or a method of doing business. The significance of the instant case is that it makes possible the patenting of a "machine system" claim covering an algorithm for a method of doing business, regardless of the type of general purpose computer used for implementation. The result of the Lower Court's view makes only the form of the claim important, not the substance of what is being claimed. The effect of that decision is to provide

[33] The relevant statutory provisions are contained in Sections 101 and 102 of the Patent Code, Title 35, U.S.C.

[34] *See* "To Promote the Progress of Useful Arts," The 1966 Report of the President's Commission on the Patent System (reprinted in S. Doc. No. 5, 90th Cong., 1st Sess. p. 21).

patent protection to abstract ideas, scientific principles, and the like, as well as methods of doing business. Such result is inconsistent with this Court's holding in *Gottschalk* v. *Benson*.[35]

The relevant clause in the Constitution which governs the granting of patents is contained in Article I, Section 8, Clause 8 which provides:

> The Congress shall have power . . . to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries.

The focus of the patent clause (and the statutes implementing that clause) is on "progress," and Congress is granted only a "qualified authority . . . limited to the promotion of advances in [science and] the useful arts." *Graham* v. *John Deere Co.*, 383 U.S. 1, 5 (1966). Because [t]he patent system must promote . . . progress," *Graham*, *supra*, "[p]atents cannot be sustained when . . . their effect is to substract from former resources freely available to skilled artisans," *Great A & P Tea Co.* v. *Supermarket Equipment Corp.*, 340 U.S. 147, 152 (1950).[36]

[35] *See* 409 U.S. at 71 where the Court said: "It is conceded that one may not patent an idea. But in practical effect that would be the result if the formula . . . were patented in this case."

[36] As this Court declared in *Precision Instrument Mfg. Co.* v. *Automotive Maintenance Mach. Co.*, 324 U.S. 806, 816 (1945):

> A patent by its very nature is affected with a public interest. As recognized by the Constitution, it is a special privilege designed to serve the public purpose of promoting the 'Progress of Science and Useful Arts.' At the same time, a patent is an exception to the general rule against monopolies and to the right to access to a free and open market. The far reaching social and economic consequences of a patent, therefore, give the public a paramount interest in seeing that patent monopolies . . . are kept within their legitimate scope.

Among such resources are the scientific principles, mental processes, methods of doing business and abstract intellectual concepts which are the basic instruments of business, science and technological development. The free interchange of such information cannot be restricted by patents. As Chief Judge Garret observed in *In re Abrams*, 188 F.2d 165, 168 (C.C.P.A. 1951):

> Citation of authority in support of the principle that claims to mental concepts which constitute the very substance of an alleged invention are not patentable is unnecessary. It is self-evident that thought is not patentable.[37]

The algorithms which are sought to be patented in this case are based on rules of logic which are more like thought and mathematical principles than anything else. They should be treated in the same manner as the algorithms in *Gottschalk* v. *Benson*.

The U.S. Patent and Trademark Office recognizes that the form of claim does not change the character of the non-patentable subject matter sought to be patented. Thus, its guidelines issued in 1968 state that "computer programming per se, whether *defined in the form of a process or apparatus shall not be patentable.*" [38] In keeping with this view, the Patent and Trademark Office

[37] *Also see* the passages from the letters of Thomas Jefferson, the first administrator of our patent system, quoted in *Graham* v. *John Deere Co.*, 383 U.S. at p. 8, n.2.

[38] Patent Office Guidelines to Examination of Application for Patents on Computer Programs, 22 Fed. Reg. 15609 (1968); emphasis added. These guidelines were suspended only after the Lower Court issued a series of decisions, which in effect held that computer programs were patentable as a "process" under the patent laws. *See, In re Prater*, 415 F.2d 1378 (C.C.P.A. 1968), *mod on reh* 415 F.2d 1393 (C.C.P.A. 1969); *In re Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969); *In re Musgrave*, 431 F.2d 883 (C.C.P.A. 1970); *In re Mahoney*, 421 F.2d 742 (C.C.P.A. 1970); *In re Foster*, 438 F.2d 1011 (C.C.P.A. 1971); *In re McIlroy*, 442 F.2d 1397 (C.C.P.A. 1971).

Board of Appeals in this case refused to allow the machine claims on the ground that non-patentable subject matter was being claimed, regardless of the form of the claim.

The claims involved in this case essentially deal with a method of doing business—a procedure for manipulating data to give an informational result—and the mere fact that a computer is used as a tool for implementing the algorithm involved in the financial banking system sought to be patented does not convert a method of doing business, or the logical principles upon which it is based, into a "patentable machine." The Lower Court's decision has misconstrued the applicable statutory provision in extending patent protection to algorithms in this fashion.

D. The Copyright Laws Provide A Viable Form Of Protection For Marketing Computer Programs

This Court in *Gottschalk* v. *Benson* observed that if proprietary protection under federal statute is considered necessary for computer programs, it should be accomplished through legislation and not through a distortion of the patent laws.[39]

In this connection the copyrighting of computer programs is becoming established as an acceptable form of protection. In 1964, the Copyright Office determined that computer programs can be registered under the copyright laws if certain requirements are met.[40] Since the an-

[39] 409 U.S. at 73. "If these programs are to be patentable, considerable problems are raised which only committees of Congress can manage, for broad powers of investigation are needed, including hearings which canvass the wide variety of views which those operating in this field entertain. The technological problems tendered in the many briefs before us indicate to us that considerable action by Congress is needed."

[40] *See* U.S. Copyright Office Announcement SML-47 (May 19, 1964). Three conditions which software must meet for copyright protection are: (1) original authorship; (2) publication of copies in

nouncement, over a thousand such programs have been registered with the Copyright Office. Of course, the existence of copyright protection does not prevent someone from individually arriving at the same result through his own efforts, and a copyright can only protect the form of expression used in a particular program.[41] Experience has shown, however, that the copyright law is a viable form of protection in marketing computer programs.

In preliminary work on copyright revision, committees of Congress have explicitly recognized copyright protection for computer programs.[42] Congress has also seen fit to enact into copyright legislation provisions for a Commission to study copyright protection in connection with new technology including computer programs.[43] This Commission will study reproduction and use of copyrighted works of authorship and recommend procedures for access as well as recognition of the rights of copyright owners.

The consensus of non-governmental experts attending a recent meeting of the World Intellectual Property Organization (WIPO), at which computer program pro-

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a form perceptible or capable of being perceptible to the human eye; (3) depositing copies for registration to consist of or include reproductions in a language intelligible to human beings.

[41] "The Uneasy Case for Copyright: A Study of Copyright In Books, Photocopies and Computer Programs," 84 Harv. L. Rev. 344, n.247 (1970); "Copyright Protection for Computer Programs," 64 Colum. L. Rev. 1274 (1964); "Scope of Protection for Computer Programs Under The Copyright Act," 14 DePaul L. Rev. 360 (1964); "Computers, The Copyright Law And Its Revision," 20 U. Fla. L. Rev. 386 (1968); Cary, "Copyright Registration and Computer Programs," 11 Bull. Copyright Soc'y 361 (1964).

[42] Senate Judiciary Committee Report on Copyright Law Revision, 93-983 dated July 3, 1974, page 104.

[43] Public Law 93-573, December 1974, "To Establish A National Commission On New Technological Uses Of Copyrighted Works And For Other Purposes."

tection discussions were conducted, was that there should be a new type of legal protection for computer programs which would resemble copyright but would be particularly tailored to suit computer software protection.[44]

V

CONCLUSION

For the foregoing reasons, we respectfully submit that the computer program sought to be patented by respondent Johnston in this case should not be eligible for patent protection and that the Lower Court's decision should be reversed.

Respectfully submitted,

JOHN S. VOORHEES
KENNETH E. KROSIN
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

Counsel for
Computer & Business Equipment Manufacturers Association (CBEMA),
Amicus Curiae

Of Counsel:

HOWREY & SIMON
1730 Pennsylvania Avenue, N.W.
Washington, D.C. 20006

July 21, 1975

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[44] June 23-27, 1975 World Intellectual Property Organization (WIPO) meeting in Geneva, Switzerland of the Advisory Group of Non-governmental Experts on the Protection of Computer Programs, Report AGCP/NGO/II/10.

Supreme Court, U. S.
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IN THE
SUPREME COURT OF THE UNITED STATES
OCTOBER TERM 1975

No. 74-1033

C. Marshall Dann,
Commissioner of Patents & Trademarks,
Petitioner,

—v.—

Thomas R. Johnston,
Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES
COURT OF CUSTOMS AND PATENT APPEALS

BRIEF *AMICUS CURIAE* FOR UNIVERSAL SOFTWARE, INC.

Charles Winn Sims
2208 Piedmont
Wichita Falls, Texas 76308
Counsel for Amicus Curiae

Of Counsel:

Francis Noel Carten
Carten & Sims
500 Summer Street
Stamford, Connecticut 06901

32 Broadway
Suite 514
New York, New York 10004

ERRATA

Page 1, in the caption, change "Patients" to "Patents".

Page 8, line 5, change "relationship" to "relationships".

Page 9, footnote 7, line 21, change "correspondense" to "correspondence".

Page 10, line 27, change "mis:apprehension" to "misapprehension".

Page 22, footnote 19, line 8, before "C24-5036-3" insert "Form".

Page 25, line 4, change "equivalence" to "equivalent".

Page 25, line 28, change "contraindicted" to "contraindicated".

Page 29, line 6, change "p. 18" to "p. 16".

Page 34, line 28, before "process" insert "a".

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IN THE SUPREME COURT OF THE UNITED STATES

OCTOBER TERM 1975

No. 74-1033

C. Marshall Dann,
Commissioner of Patients & Trademarks,
Petitioner,

—v.—

Thomas R. Johnston,
Respondent.

ON WRIT OF CERTIORARI TO THE UNITED STATES
COURT OF CUSTOMS AND PATENT APPEALS

BRIEF *AMICUS CURIAE*
FOR
UNIVERSAL SOFTWARE, INC.

I

QUESTIONS PRESENTED

1. Whether a new machine, which is defined as patentable subject matter under 35 USC §101, becomes unpatentable if it is formed by the interconnection of components of a so-called general purpose digital computer which is known, the interconnections being effected by novel and unobvious program software to define the new machine's specification.

2. Whether the collection of structurally and functionally interrelated components commonly referred to as a gen-

eral purpose digital computer, when restructured by program software to form a physical realization of a machine specification of an accounting machine, comprises patentable subject matter under 35 USC §101 when accurately claimed as a machine system.

II

INTEREST OF UNIVERSAL SOFTWARE, INC.

This brief *amicus curiae* is submitted by Universal Software, Inc., a Connecticut corporation, (hereinafter referred to as "Universal") in accordance with Rule 42(2) of this Court. Both petitioner and respondent have consented to the filing of this brief. The letters of consent have been filed with the Clerk of this Court, accompanying the required number of copies of this brief.

Universal is engaged in the design, manufacture, and sale of machine systems specifications (program software) which, when combined with the hardware commonly known as general purpose digital computers, restructures such hardware into new and enhanced machines having capabilities not present in the hardware as sold by the manufacturers. Universal is exemplary of independent software houses who produce and sell machine specifications of either enhanced general purpose digital computers or special purpose digital computers. These software producers have made heavy investments of their ingenuity, time, effort, and capital in making highly significant contributions to the arts of computer systems design, which contributions are deserving of patent protection.

Although Universal does not have any direct interest in the patent application of respondent, Universal does have a deep and abiding interest in the determination of the broader issues in this case, since this Court's decision presumably will resolve the question of patentability of computer program software in a machine system claim format. The resolution of these issues in favor of respondent will affect the development of the data processing industry in the United States in a beneficial manner, encouraging disclosure of commercially viable and technically superior products to potential investors in the financial community and to potential users and improvers in the technical community, whose interests are best served by making available all existing knowledge of the state of the art. Such disclosures may be in the form of either a patent specification, or a purely defensive publication aimed at foreclosing the grant to another of a patent on the published invention. Thus, the widest possible dissemination of knowledge of the art will result, and thereby insure that advances will occur in the program software arts at an accelerated rate characteristic of developments in other crucial and dynamic technologies. The ultimate effect of a holding that computer programs of the type sought to be patented in this case are patentable subject matter would be to encourage competition, not to foreclose it.

This brief undertakes to refute certain inappropriate technical characterizations of program inventions, which, regrettably, have gained currency and caused great uncertainty in the law. Alternative characterizations more in keeping with technical reality will be presented, showing that a program invention such as that of respondent (1) is statutory subject matter and (2) is appropriately claimed as a machine system, the manner best suited to set forth the invention in its true dimensions.

Thus, it is Universal's position that the majority of the Lower Court correctly refrained from applying this Court's decision in *Gottschalk v. Benson*, 409 U.S. 63 (1972).

III

THE NATURE OF THE COMPUTER AND COMPUTER PROGRAMS

The machine known as a general purpose digital computer affords a tremendous problem-solving capability by providing within a relatively small space all of the various components requisite for fashioning more powerful machines for solving problems derivative from a highly-industrialized environment. Circuits are uniquely

defined by program software interconnection of the various components, these circuits being suitable for storing, retrieving, organizing, and manipulating signals representative of parameters meaningful within the field of interest. Thus, the computer expands the ability of the technical community to translate problems perceived in any segment of an industrial environment into machines or machine systems capable of solving such problems. Although a general purpose digital computer has the inherent potential to be fashioned into a large variety of machines capable of solving a large variety of problems, the number of machines which may be fashioned is limited by the ingenuity, time, and funds available to implement a machine solution to a particular machine problem to be solved.

Every special purpose digital computer operates solely in accordance with its specification. Its specification is its program. The program defines the various circuits which manipulate the data signals in accordance with an *effective procedure* for machine control which is accomplished in a step-by-step manner. Although the terms have frequently been confused, the effective procedure is distinct from the algorithm defining the industrial problem to be solved.[1] In this industrial context, the algorithm is the original procedure proposed to describe the conceptualization of the machine problem to be solved, expressed in a mathematical or other symbolic manner. The effective procedure is that sequence of operations which is, in fact, effective as a control mechanism and which, in fact, defines a machine solution to a machine problem to be solved.[2]

A machine specification may be created for defining a machine suitable for determining the proper course to the moon, for example. Using a convenient language such as mathematics, there is developed a model of the

[1]M.L. Minsky, *Computation: Finite And Infinite State Machines*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey (1967), pp. 105-107. This is presently a basic text of computer science, and was originally used by Professor Minsky as a textbook in the Department of Electrical Engineering at the Massachusetts Institute of Technology.

[2]Ibid.

environment within which the fully-formed, thoroughly-tested machine is to function. Logical sequences of operation of that machine may then be designed symbolically, for example, by a flow chart. The next step in the machine's design is the development of program software embodying a representation of a detailed set of operations for altering the general purpose digital computer's functioning to define the procedure then thought to be effective for simulating the new computer sought to be specified. This sequence of operations, or untested program, is successively refined until the new machine is completely specified. In devising the machine specification, it is necessary for the designer to be knowledgeable about the particular computer's characteristics, i.e., how it actually manipulates signals representative of the data of interest, in order for him to optimize his new machine with respect to the characteristics of the old.

Typically, the general purpose digital computer provided with the untested program is an inoperative device. Considerable skill may be required in carrying out the implementation of the machine solution, particularly in view of the limited number of fixed operations which may be performed by the general purpose digital computer. Devising the finished machine, often through many intermediate debugging steps, generally requires the continuing attention of a professional whose insights may be valuable in both the original perception of the machine problem to be solved and the design of the machine to solve it. In many instances, the inventive process is so complex as to require substantial innovative effort on the part of every member of a project team, including the computer machine process specialist.

The difficulty of conceptualization and communication of this subject matter may be readily appreciated by reference to the rather strained analogies which have been employed by Amici in *Benson* and in the instant case. Notable is the player piano analogy (Pet. Br. 16, 35).[3] No player piano includes conditional logic circuitry, which is essential in forming any digital computer. Such circuitry

[3]"Pet. Br."refers to Petitioner's Brief on the merits.

enables conditional branching, i.e., selection of the next operation on the basis of the result of a completed operation. The specification of interconnections of conditional logic circuits in a general purpose digital computer is necessary in order that the machine fashioned therefrom, namely, a special purpose digital computer, be capable of changing from one functionally operative state to another responsive to events represented by internally-manipulated data signals during the course of its functioning. Although it may be refreshing to have a player piano change its tune by reforming its internal structure without external manipulation, no such instrument has ever done so.

It has been said that a computer program is equivalent to the paper music roll instructions to a player piano (Pet. Br. 35). However, the paper music roll does not restructure the player piano; it merely causes certain notes to be played in a predetermined sequence. Thus, if a program software were truly like a piano roll, it would simply cause the general purpose digital computer to generate a predefined sequence of signals in response to the signals from the program machine. This is not the manner of interaction of the program with the general purpose computer. The technological reality is that program software causes new circuits to be formed in the *general purpose machine,*[4] thereby changing it to a *special purpose*

[4]That a general purpose digital computer may accurately be denominated a machine has a sound basis in the theories of electronics and computer science. See Minsky, *supra* note 1, p. 200.

machine[5] or an *enhanced/extended general purpose machine*[6] having new problem-solving capabilities which qualitatively or quantitatively extend beyond the capabilities of the general purpose machine.

[5]A sound theoretical basis for the proposition that a program converts a general purpose digital computer (or machine) into a special purpose digital computer (or machine) is found in Minsky, *supra* note 1, p. 200. Precise definitions adequate to the statement of a theoretical basis for this phenomenon are found in section 11.2 at p. 204 and in Theorems 14.1-1 at p. 257 and 14.2-1 at p. 258. Significant milestones in development of such theoretical basis are the following papers: A.M. Turing, "On Computable Numbers, With An Application to the Entscheidungsproblem," *Proc. London Math. Soc.*, Ser. 2-42 (1936), pp. 230-265; H. Wang, "A Variant to Turing's Theory of Computing Machines", *Journal ACM*, Vol. 4, No. 1 (1957).

[6]An application program defines structure which is a special purpose digital computer. A system program defines structure which is an enhanced or extended general purpose digital computer. A straightforward mathematical technique will be applied to the consideration of the structure of machines. In the strictest sense, it is mathematical only to the extent that logic is mathematics, an important proposition in the study of machines. There will be applied the technique of inductive proof.

For every positive integer n, let P(n) be a proposition that is either true or false. If (i) P(1) is true and (ii) whenever this proposition is true for the positive integer n it is also true for the positive integer n + 1, then P(n) is true for all positive integers n.

Proposition: A new program defines a new machine.

Let an application program represent the proposition P(1). Then no system program is consistent with the Proposition, i.e., there exists no program to which an integer greater than 1 may be assigned, all system programs being available when the application program is defined. We have a contradiction, so that it is irrational to start with the application program.

Let some system program represent P(1), another P(n) and another P(n + 1). Then if the Proposition can be shown to be true, it will be true also when choosing n to represent the last system program found by the application programmer to be helpful in designing his machine, and n + 1 to represent identically the application program.

By this reasoning alone there is no structural difference between a system program and an application program.

Induction is succinctly defined in Olmsted, *Intermediate Analysis-Theory of Functions Of One Real Variable*, Appleton-Century-Crofts, New York, N.Y. (1956).

A general purpose digital computer has been said to be a warehouse of functionally unrelated parts. This is true only in the sense that the relationships of the parts are not defined for the solution of any specific problem. The relationship of the parts within a general purpose machine are well-defined in the mechanical sense, but are almost endlessly variable in the electrical sense. Program software in combination with a general purpose digital computer creates what has been termed "instant hardware" in the form of either an enhanced general purpose digital computer or a special purpose digital computer by making the electrical connections which form those computers.

IV

ARGUMENT

A. The Lower Court Correctly Refrained From Applying *Gottschalk v. Benson*

In *Gottschalk v. Benson,* this Court decided essentially that a signal conversion method which is defined in mathematical terms is not a process within the meaning of 35 U.S.C. §100(b). It does not appear to have been appreciated that mathematics has a broad, generally-accepted definition which encompasses not only number systems and the manipulation of numbers, but also logistics, axiomatic investigation, symbolic language, and, for that matter, experience. Since mathematics is the language employed by engineers and scientists to express their experience, it is unrealistic to have a definition of mathematics in law different than that understood by Euclid, Descartes, Leibniz, Gauss, LaPlace, Newton, Fourier and most significantly, Galois, the Father of

Modern Mathematics, whose notion of isomorphism[7] leads one to the conclusion that a mathematician is more nearly a pioneering observer than a chronicler. That which is best communicated in terms of a language mathematical in nature and experiential in content and context should be available to describe an invention which has been conceived and reduced to practice as a procedure or sequence of steps. In any event, it was not held that an exhaustive list of patentable processes had been compiled by the year 1972, nor are processes, de-

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[7]That Evariste Galois is often referred to as The Father of Modern Mathematics is attributed to the extraordinary breadth of modern structures whose behavior can be examined, explained and digested with reference to his original notion of isomorphism, defined most simply as a one-to-one correspondence between elements of groups. The groups of interest have certain properties, the most important of which is the manner in which elements are combined while maintaining their identity as members of that group by the definition of membership therein. The one-to-one correspondence survives combinations. This is the basis for abstract algebra (synonym of modern algebra). G. Birkhoff and S. MacLane, *A Survey of Modern Algebra,* The MacMillan Company, New York (1958). The simplest example is the simultaneous consideration of an algebra (or set of rules) governing combinations of odd and even integers and one of the number system base two (or modulo 2) which has but two integers, 0 and 1.:

even + even = odd + odd = even	even + odd = odd
even + even = even · odd = even	odd · odd = odd
0 + 0 = 1 + 1 = 0	0 + 1 = 1
0 · 0 = 0 · 1 = 0	1 · 1 = 1

The one-one correspondense is *even* ↔ *0; odd* ↔ *1,* which is an isomorphism.

Both the most general control of instantaneous interconnections of circuits in a general purpose digital computer and the specific manner in which it counts can be explained with precisely this isomorphism. For a much deeper analysis of theories of structures of general purpose digital computers traceable to the work of Galois, there is to consider: O. Rabin and D. Scott, "Finite Automata And Their Decision Problems," *IBM Journal of Research and Development,* Vol. 3, No. 2 (April 1959), pp. 114-125; B. Krohn and J.L. Rhodes, "Algebraic Theory of Machines," *Mathematical Theory of Automata,* Polytechnic Press, Brooklyn (1963), pp. 341-384; M.P. Schutzenberger, "On Finite Monoids Having Only Trivial Subgroups", *Information and Control* 8 (1965), pp. 190-194.

Galois died in 1832 at the age of 21 years.

fined by an algorithm or otherwise, before the Court in the present case.

In the decision below in the instant case, the Court of Customs and Patent Appeals held that a general purpose digital computer combined with program software to form a machine system for performing a financial banking procedure is patentable subject matter under 35 U.S.C. §101. However, Amicus CBEMA urges that the record does not show that a machine has been invented or disclosed in respondent's patent application, and points to respondent's statements that "the invention is being sold as a program to banks" and "was reduced to practice in the software form of computer programs . . ." (CBEMA Br. 8).[8] These statements in no way conflict with respondent's assertion that such programs define a control system in the form of a special purpose digital computer. Respondent has not conceded that the merchantable product, viz., program software, is anything less than a machine for restructuring a general purpose machine to form the machine system known as a special purpose machine for carrying out a financial banking procedure. Thus, respondent's real contribution is much more than a financial banking algorithm. Since respondent's claims are drawn to a machine system, clearly the intent of respondent is to define his invention as a machine system, not as an algorithm. Amicus CBEMA's basic mis:apprehension of the commercial realities of program machine design and implementation would lead one to confuse a flow-charted and coded financial banking procedure with an effective procedure in the form of a completely debugged and tested program. Only the latter, i.e., the running program, is a commodity which is merchantable to astute and knowledgeable businessmen such as bankers and systems accountants. Absent this merchantable program machine, whether in the form of punched cards, magnetic tape or disks, the general purpose digital computer is not capable of solving any problem. Thus, a general purpose machine in combination with an application program defines a machine system for solving a problem. The notion that

[8] "CBEMA Br." refers to Amicus CBEMA's Brief on the merits.

program software *simply* defines computer routines (CBEMA Br. 8, note 9) is alien to those in the data processing community, particularly to those technically competent to carry a symbolic representation of a procedure into a running program. Any implication that simplicity is an attribute of either the design or implementation of the machine system claimed by respondent does not conform to reality.

Financial banking procedures whose implementation has been principally manual, or has involved certain automated procedures requiring frequent or continuing human intervention, have been considered methods of doing business, which like mathematics of the genus defining laws of nature or scientific principles, have been considered unpatentable *per se*. In contradistinction, respondent has disclosed and claimed a machine system, i.e., a hardware implementation of his effective procedure which is the solution to a machine problem to be solved. Therefore, respondent should be considered as having defined patentable subject matter, notwithstanding that the machine problem may have been formulated as a numerical procedure or algorithm. Unless this Court holds that respondent's application program machine is patentable subject matter as claimed, it will be impossible to adequately define the scope of novel and unobvious hardware implementations in the form best suited to convey to the technical community the essence of extremely valuable and technologically superior contributions to the art of program machines. To a person working in this art, a recitation of a particular general purpose digital computer or a class of general purpose digital computers suitable for adaptation to carry a disclosed program invention into effect in the form of a special purpose digital computer is sufficient to enable the practice of the invention disclosed in respondent's patent application, viz, a control system or special purpose digital computer. Such a disclosure would be enabling in patent applications disclosing novel and unobvious program machines of any genus, including Amicus Universal's commercially viable, novel and unobvious system program machine defining an enhanced general purpose digital computer.

Program software interactively combined with a general purpose digital computer should be considered patentable as a machine system by virtue of the synergistic interaction with the general purpose digital computer, notwithstanding that the program may be described in terms of an algorithm which may or may not be expressed in a mathematical language. *Anderson's Black Rock v. Pavement Salvage Co., Inc.*, 396 U.S. 57 (1969). In the instant case, there is precisely the synergism considered by this Court in *Anderson's*, i.e., that the program and the computer combined produce a function which neither the program nor the computer can produce alone. In any event, *Anderson's* dealt with a combination of *old elements*; the instant case deals with a *new program* in a machine system.

The interaction of the program machine with the general purpose machine is also within the definition of synergism as it is commonly understood in the biochemical sense. Such interaction is much the same as neurochemical reactions causing muscles to expand and contract in synchronism, thereby achieving the control and coordination of the musculature requisite to accomplishing a task. Such biochemical activity does not involve any intellectual process.

It is not asserted that the relation between chemical reactions in a physiological context and program control of the various components and sub-systems of the general purpose digital computer is a completely satisfactory analogy. It is simply pointed out that the simultaneous action of separate agencies toward the achieving of a given purpose is not a concept alien to human experience. However, biochemical reactions are more readily correlated with the conditional responses of a special purpose digital computer to data signals representative of an environment than the predefined responses of a player piano to the sensing of the holes in the piano roll having no more information content than some version of a composer's creation, and lacking any subtle phrasing at that.

B. The Inventive Process, The Persons Skilled In The Art, And the Technological Realities Of Program Machine Design Must be Understood In Order To Assess Inventions In This Art.

1. The Inventive Process In The Art Of Program Machine Design.

Among those making significant contributions to the art of program machine design, there is a unitary view of the process of invention of a program machine as including these elements:

(1) formulating the machine problem to be solved;

(2) flow-charting a purportedly effective procedure for solving the machine problem;

(3) devising a program machine defining said purportedly effective procedure; and

(4) implementation, i.e., getting the program onto the general purpose machine and running.

The fourth element, implementation, has not yet been treated before this Court. It is absent from the petitioner's characterization of the inventive process (Pet. Br. 16-17), notwithstanding the Pickwickian use of the word "implementation" in imprecisely defining a second "mode of activity". Petitioner has stated that it would be "useful" to consider only the first three elements of the inventive process. This narrow view is indeed "useful" if contributions to the art of program machines are to be characterized as nothing more than intellectual exercises. To this unworthy end, it is "useful" that program machines conceived and expressed originally in abstract terms be thought of as nothing more than abstractions. If this false premise is accepted, it then becomes easy to

apply the mental step doctrine[9] to deny the patentability of the enhanced general purpose machines or the special purpose machines which, like all other inventions, are the fruit of intellectual activity. Such an undesirable result is comparable to denying the patentability of electrical circuits which are the physical embodiment of a mathematical model consisting of parametric equations defining complex interrelations and interactions among circuit components.[10]

2. Persons Skilled In The Art Of Program Machine Design.

Three innovators in the art of program machine design are representative of the statutorily-hypothesized[11] "person skilled in the art". Many real-life individuals could fall within more than one of these catagories.

(1) The Empiricist

His inventions are conceived and reduced to practice, in the form of an actual implementation, on the basis of his degree of familiarity with the manufacturer's hardware, existing systems programs, and the cooperative association between the two. His machine specification, when appropriately manipulated and combined with the products of the hardware manufacturers, may be an application

[9]See *Halliburton Oil Well Cementing Co. v. Walker*, 145 F.2d 817 (9th Cir. 1944); *Application of Heritage*, 150 F.2d 554 (C.C.P.A. 1945); *Application of Abrams*, 188 F.2d 165 (C.C.P.A. 1951); *Application of Lundberg*, 197 F.2d 336 (C.C.P.A. 1952); *Application of Venner*, 262 F.2d 91 (C.C.P.A. 1958); *Application of Jones*, 373 F.2d 1007 (C.C.P.A. 1967); *Application of Prater*, 415 F.2d 1378 (C.C.P.A. 1968), mod. on reh. 415 F.2d 1393 (C.C.P.A. 1969); *Application of Bernhart*, 417 F.2d 1395 (C.C.P.A. 1969); *Application of Mahoney* 412 F.2d 742 (C.C.P.A. 1970); *Application of Musgrave* 431 F.2d 882 (C.C.P.A. 1970); *Application of Foster*, 438 F.2d 1011 (C.C.P.A. 1971); *Application of Benson*, 441 F.2d 682 (C.C.P.A. 1971), reversed on other grounds *sub nom. Gottschalk v. Benson*, 409 U.S. 63; *Application of McIlroy* 442 F.2d 1397 (C.C.P.A. 1971); *Application of Waldbaum* 457 F.2d 997 (C.C.P.A. 1972); *Application of Christensen* 478 F.2d 1392 (C.C.P.A. 1973).

[10]C.A. Desoer and E.S. Kuh, *Basic Circuit Theory*, McGraw-Hill Book Company (1966).

[11]35 U.S.C. §112, first paragraph.

program which defines a special purpose digital computer optimized with respect to the application's definition, the utilization of the hardware, and the utilization of the existing systems software. Alternatively, the Empiricist may devise a machine specification which, when appropriately manipulated and combined with the products of the hardware manufacturers, works a new synergism therebetween which is physically embodied in an enhanced or extended general purpose digital computer.

(2) The Systems Architect

His inventions are machine specifications which define the original synergism between the manufacturer's hardware and systems software, that synergism being embodied in an integrated general purpose digital computer the specification of which may define the starting point for an Empiricist concerned with implementation or development of application program machines for defining special purpose digital computers. Of course, it is also true that the original system program machine may define the starting point for an Empiricist concerned with designing an enhanced or extended general purpose digital computer. (If the second Empiricist has made his contribution, the first Empiricist would typically design his machine from the components of the enhanced machine.) The Systems Architect is an inventor, his protestations to the contrary not withstanding. His protestations are typically induced by his employers, who wish to foreclose any alternatives to the "free" systems software offered with their machines.

(3) The Academician

His contributions may be in the field of computer science, which is concerned with future implementations or machine development. The Academician has made some of his most significant contributions in the investigation of the computer and its role in society. From a purely technical standpoint, the Academicians of interest are those whose perceptions lend an insight into the nature of the computer's structure. A tool for these investigations in

many instances is mathematics of a genus which has been defined as axiomatic or logistic, as opposed to definitive and descriptive of naturally-occurring phenomena.

3. The Interaction Of The Empiricist, The Systems Architect, And The Academician.

In reality, the program machine design specialization is distributed among all three of these hypothetical innovative specialists. Thus, that one Empiricist may proceed from the work of a Systems Architect, or from the work of another Empiricist, in no way conflicts with our definitions. It is always true that the innovator must isolate his machine problem from all others, and develop his specification of a machine solution either independently or cooperatively in association with members of a project team concerned with that problem and the new machine to be fashioned for its solution.

The Systems Architect, having a keen appreciation of the principles of computer science (and engineering, to the extent that it is distinct), is able to communicate an accurate definition of the structure of the machine to the balance of the technical community, i.e., the collection of Empiricists, so that they may have a precise definition of the design parameters affecting at least the implementation portion of a specific machine problem to be solved. The Academician performs a variety of functions in advancing the state of the art. These functions may best be set forth in historical sequence of advances within two repetitive cycles. The first cycle includes Observation, Abstracting, Formalization, Propagation, Observation .... The second cycle includes Logical Formulation, Perception and Definition of Development in terms of a Formalism, Propagation, Logical Formulation .... The first cycle is relatively short in duration and more nearly responsive to immediate demands of the technical community formed by the Empiricists. There has been no completed second cycle. Certain of the demands of at least the technical community formed by the Systems Architects are met in the near term by second-cycle activities. The advancement of the state of the art of program machine design will always be the result of discrete events along the course of both cycles.

Turning to the work of the Empiricist, what exists insofar as he is concerned is precisely what he "sees". "What is seen by the application programmer or the systems programmer" is an expression frequently used in the art, principally because the structure of the general purpose digital computer is exceedingly complex. Therefore, there is a common practice of explaining its structure in terms of a paradigm[12] which facilitates communication of these labyrinthian complexities. Three working definitions of terms required to explain both the manner in which the Architect communicates his knowledge to the Empiricist and the paradigm are set forth hereunder.

Virtualization:

making available to the Empiricist an understanding of the resources of the general purpose digital computer of interest to that Empiricist as a member of a subclass of either application program machine designers or enhanced/extended machine designers.

Hierarchial view:

the viewpoint that the general purpose digital computer is best described in the technically accurate terms of machines within machines, or nested machines.[13] There are less pertinent alternative views, viz., the process view[14] and the resource management view[15], but these are merely devices facilitating understanding in a less general case. One's choice of viewpoint is determined by whether a convenient explanation or a definitive phenomenological exposition is desired. Systems Architects communicate using terminology in alignment with all three views simultaneously.[16] This

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[12]E.W. Dijkstra, "The Structure of the T.H.E. Multiprogramming System", *Comm. ACM*, Vol. 11, No. 5 (May 1968), pp. 341-346.

[13]Ibid.

[14]S.E. Madnick and J.J. Donovan, *Operating Systems*, McGraw-Hill Book Company, New York (1974).

[15]Ibid.

[16]U.O. Gagliardi, "Trends In Computing System Architecture," *Proceedings of the IEEE*, Vol. 63, No. 6 (June 1975).

is because these views and their terminology are not in conflict as media of communication.

Machine process:

Consonant with the definitions of virtualization and the hierarchial view, a machine may be defined as a process requiring resources shared with the same or another nested machine level which may also be conveniently discussed as a process. It is convenient to think of a machine as a process because during its functioning, i.e., the performance of its unique operations, it is a *processor*. The ultimate test of its physical characterization as a machine is whether or not unique circuit interconnections within the innermost level or bare machine are defined during the time interval in which the machine exists. The term *machine process* is quite distinct from mathematical process and is, in fact, equivalent to the term *effective procedure for machine control.*

Effective communication of these highly complex concepts is more nearly contextual than semantical, and the requirement that a context be considered increases as it is determined what is to be "seen" by larger and larger numbers of Empiricists. Technically accurate alternative modes of expression are required for describing this new category of machines which may be viewed alternatively as control mechanisms, or nested machines, or machines performing operations defining machine processes which are physically realizable only through unique interconnections of circuits, thereby suggesting that the first two characterizations are the more technically accurate, and the third the more convenient. The historical

development of these modes of expression as defined herein is well-documented.[17]

4. An Explanatory Paradigm

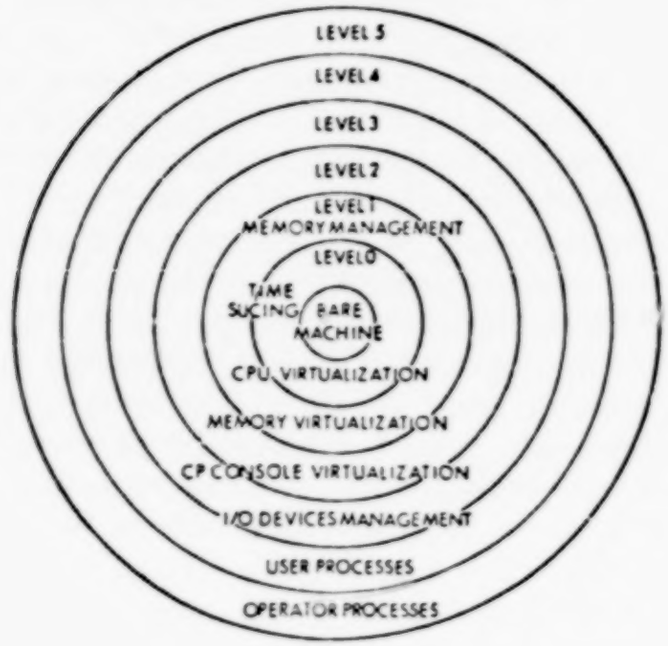

Fig. 1

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[17]A.S. Noble, Jr. "Design of An Integrated Programming and Operating System. Part I. System Considerations and the Monitor.", *IBM Systems Journal*, Vol. 7, No. 2 (June 1963), pp. 153-161; *Master Control Program Characteristics*, B5500 Information Processing Systems Bulletin 5000-21003, Burroughs Corp. (May 1962); W.H. Desmonde, *Real-Time Data Processing Systems: Introductory Concepts*, Prentice-Hall, Inc., New Jersey (1964); E.W. Dijkstra, "Solution of a Problem in Concurrent Programming Control". *Comm. ACM*, Vol. 8, No. 9 (September 1965), p. 569; N. Wirth, A Note on "Program Structures for Parallel Processing" *Comm. ACM*, Vol. 9, No. 5 (May 1966), pp. 320-321, (letter to the editor); E.W. Dijkstra, *Cooperating Sequential Processes* (Preliminary Version), Mathematics Department, Technological University, Eindhoven, The Netherlands (September 1965); D.W. Knuth, *Comm. ACM*, Vol. 9, No. 5 (May 1966), pp. 321-322 (letter to the editor); J.B. Dennis, "Segmentation and the Design of Multiprogrammed Computer Systems", *Journal ACM*, Vol. 12, No. 4 (October 1965), pp. 589-602; B.W. Arden, B.A. Galler, T.C. O'Brian and F.H. Westervelt, "Program and Addressing Structure in a Time-Sharing Environment", *Journal ACM*, Vol. 13, No. 1 (January 1966), pp. 1-16.

The paradigm shown in Fig. 1. is an hierarchical structure[18] consonant with the hierarchial view, providing a visual conceptualization of nested machines. There is a virtualization looking from the outermost rings of the diagram inwardly, and looking from the innermost rings outwardly. By our definitions, the Empiricist is typically the one whose requirement is to have a very complex device's resources or components arranged in virtualized subsystems, while the Systems Architect, charged with the responsibility of virtualizing, would most conveniently view the program machine to be combined with his machine as a machine process (Level 4 in Fig. 1). The integrated (nested) machine with no User Process at Level 4 has no function whatever. It is a general purpose digital computer, i.e., it is only capable of being defined as a machine having a specific purpose by the machine specification of the Empiricist. No specific machine exists absent a User Process defined by the the machine specification. To the extent that the User Process has any relation to a traditional definition of process, by logical exclusion it would have to be a process for utilization of the remainder of the machine, which is equivalent to a process for sequentially defining circuit interconnections at Level 0 in Fig. 1. The aspect of the Systems Architect's work termed "looking out" addresses itself to the organization of the general purpose digital computer so that it is virtualized in an hierarchical structure facilitating the implementation phase of the Empiricist's work. A simple way of viewing this aspect is to define the innermost virtualized machine as the Central Processing Unit in combination with a facility for defining time intervals for effective procedure execution, i.e., controlling access to the various facilities consonant with the machine specification. The innermost machine facilities are thus sequentially shared by the outermost machines. This time slicing is performed by a timing mechanism for defining when the outermost machines in Fig. 1 are to have their instructions decoded in a manner defined by the Systems Architect to exercise the most general control over the innermost machine's components or subsystems in an optimum manner.

[18]Dijkstra, *supra* note 12.

In the paradigm of Fig. 1, "looking out" from Level 0 to successively higher levels is merely an organizational view of general structure that will behave in a generally predictable manner perceived by the Empiricist "looking in". To relate this to the earlier discussion, "looking out" is defining how the circuits might be interconnected as a general proposition to facilitate optimum utilization by the program machine or special purpose digital computer designer; "looking in" is determining the shallowest penetration that will be adequate to an understanding of the structure sufficient to design the new machine. Levels 0 and 1 are generally referred to as the resident nucleus. The simplest model of the resident nucleus includes (a) the Central Processing Unit, (b) the timing mechanism, (c) the main memory and (d) the most basic management of the three. The Systems Architect would normally consider the resident nucleus as exclusively within his province. The Empiricist typically designs a machine working at all levels higher than Level 1. The Systems Architect's manifold tasks include organizing and structuring the various components of the general purpose digital computer to perform optimally as the nucleus for the largest number of Empiricists desiring to structure either an enhanced general purpose digital computer or a special purpose digital computer, and communicating the organization and functioning of the nested machines to the Empiricist in a manner best suited to facilitate the accomplishment of the Empiricist's task.

Any Empiricist works with a machine of a given description to structure a new machine. Certain Empiricists would treat more with applications problems derivative from the industrial environment, and others more with systems problems defined by the functional characteristics of the original machine. This is the principal reason why the Systems Architect chooses alternative modes of

expression of the original machine's virtualization[19] to make the full capabilities or resources available to those "looking in" to any desired depth.

5. The Technological Equivalence of Hardware, Firmware, and Software.

Advances in the state of the art of machine implementation are constantly changing the boundary between the *soft* and *nonsoft* portions of the generalized computer system.[20] Computer system architecture is the collection of the various layers of basic elements or building blocks composing a computer system in their nesting relationship and with the media of implementation. The media of implementation are: (1) hardware or built-in logic, viz., the actual circuits which have the inherent capability of being interconnected to direct signals and combine them in a manner similar to the exercise of logic; (2) firmware, i.e., procedures coded in a control store affording greater speed and ease of modification than hardware, but less than software; and (3) software, i.e., procedures coded in an easily alterable main storage memory. Determining the proper media mix is a critical part of the System Architect's task, since it affects the key tradeoff, viz., ease of maintenance versus cost/performance.

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[19]Typical examples of a Systems Architect's Virtualization of the modern general purpose digital computer to communicate its attributes to Empiricists, which examples demonstrate that by "looking in" one's perception would be that successive levels define "nested machines", are found in the following collection of one manufacturer's publications:

IBM System/360 Disk Operating System, System Control and Systems Service Programs, C24-5036-3.

IBM System/360 Disk and Tape Operating Systems, Assembler Specifications, Form C24-3414.

IBM System/360 Disk Operating System Supervisor and Input/Output Macros, Form C24-5037.

IBM System/360 Disk Operating System, Data Management Concepts, Form C24-3427.

IBM System/360 Principles of Operation, Form A22-6821.

[20]Gagliardi, *supra* note 16.

The procedures coded in the various media are effective procedures for specifically directing and combining signals in a code having the representation 1 0 1 0 1 .....meaning ON OFF ON OFF ON ..... The software medium is more easily alterable than hardware or firmware, just as it is easier to turn on the lights than to pursue the setting sun. What is embodied in the software medium is an implementation of a machine solution, designed in a manner most readily realized physically. This says nothing about its ease of design. Ease is a relative term in an engineering or scientific context, just as in a more general context. In order that anything of value be accomplished by the general purpose digital computer, thousands of switches must be turned ON or OFF during substantially the same time frame of reference. The time frame of reference is on the order of millionths or even billionths of a second. A code precisely the same as that described above is used to control the setting of the multitude of switches. These

switches reside in a plurality of circuits or arrangements of such circuits, which are defined by the setting of the switches.[21]

The running program therefore defines, in sequence, a great number of unique circuits. Thus, although program software is often called "instant hardware"[22], it is more appropriately termed "instantaneously-defined hardware combinations collectively suitable for specifying a new machine whose operational functionality is appropriate to implementing a machine solution to a machine problem to be solved." Defining the appropriate mix of implementation media may be a continuing process, even for a special purpose digital computer al-

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[21]U.S. Patent No. 3,500,062 discloses an exemplary logic circuit which is, generically, an inverter, but provided with a plurality of elements contained therein having the inherent capability of instantaneously changing states, i.e., switches. The switch settings are eached defined logically as either O = OFF or 1 = ON at any given time, there being an additionally provided master switch which would best be defined as a *theoretical* switch, not being integrally a part of the circuit but rather being a signal serving as one of the inputs thereto. The circuit is of interest in that it is a basic building block of the general purpose digital computer, adaptable as the functional equivalent of either an EXCLUSIVE OR useful in performing arithmetic or an $\overline{\text{EXCLUSIVE OR}}$ (the logical complement) useful as a conditional logic circuit. Concerning the circuit, all of the following statements are true:

(1) Each and every switch may be set bv any of the implementation media a) hardware; b) firmware; or c) software.

(2) All of the inputs and outputs are the logical voltage equivalents of 1 or 0.

(3) The operation of the circuit is "virtualized looking out" to the extent that the source of the input signals is a matter of complete indifference.

(4) Additional circuits precisely the same as the one disclosed could be grouped almost indefinitely to define a substantial portion of the "bare machine", for all of which each of the first three statements could also be made. The output of such circuits could provide the inputs to other identical circuits, as, for example, in a multi-stage adder.

[22]J. Scafetta, Jr., "Computer Software Protection: The Copyright Revision Bills and Alternatives", *The John Marshall Journal of Practice & Procedure*, Vol. 8, No. 3 (Spring Term, 1975), p. 383.

ready designed and functioning. The three media are, as a matter of technological fact, interchangeable and therefore functionally equivalent.[23]

Exemplary of the equivalence functionality of the alternative media is Digital Signal Processing[24], a precise science requiring certain architectural insights and most readily understood by examining the environment within which the machine problem to be solved arises. The term itself may be accurately defined as directing and combining signals arriving from an external environment in such great number and at such a high rate that no matter how complex their combination, it must be accomplished at an extraordinarily high rate, as though the signals were being merely processed, a term often applied in a context wherein the combinations may be *readily* accomplished over a relatively short time frame, making time for combining signals a secondary constraint. Thus, digital signal processing machines are within the genus of *real time machines,* i.e., machines which process data almost as fast as it is received to produce correlated output signals.

Digital signal processing was originally accomplished with analog computers because of their inherent characteristic that, once a particular machine is properly designed and structured, solutions are available virtually instantaneously responsive to input signals, and because inefficiencies in operation of early models of digital computers contraindicted their choice. As the speed and efficiency of general purpose digital computers improved, the *functional equivalents of the analog machines* were designed and implemented as *special purpose digital computers,* the functionality of the digital machine being defined principally by program software. These machines yet proved to be too slow to be economical.

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[23]J. Allen, "Computer Architecture For Signal Processing", *Proceedings of the IEEE*, Vol. 63, No. 4 (April 1975).

[24]Ibid. at p. 624: "In recent years, however, many studies have revealed structural aspects of digital signal-processing tasks which could be exploited in hardware design. As a result, there have been a number of hard-wired and programmable machines constructed which provide large speedup over general purpose processors, and which often also reduce the cost of the calculations."

As new digital technologies were developed, e.g., improvements in the switches, particularly speed-up of their inherent capability for changing states, it was observed by the Systems Architects that the critical functions might best be moved from Level 4 to Levels 0 and 1 in Fig. 1. This shifting of functions was implemented by designing new codes and a means (firmware) for their interpretation or, alternatively, by permanently wiring certain functions. Thus, all means for defining functionality in adapting a digital computer to the solution of a specific problem are interchangeable, and all such means define structure.

6. Higher Level Languages As Definitions of Machines Defining Alternative Modes of Implementation.

The development of higher level algorithm coding languages such as FORTRAN and ALGOL is typical of the work of the Academician, responding to what is called application pull, viz., the influence of real-world problems on the sequence of technical development. With the perception that the general purpose digital computer had a broad spectrum of possible end uses to which it might be adapted, there developed a requirement for making these machines more readily accessible to members of the scientific community whose interest, at an introductory or entry level of their work with these new general purpose machines, was more in translating formulae (algorithms) with relative ease than in optimizing design of the special purpose machines tailored to the solution of their problem. The intermediary between the conceptualizing individual treating principally with formulation of an algorithm in an industrial context and the particular general purpose machine sought to be adapted to that context is the Academician who abstracts the characteristics of the original machine and formulates near-optimum translation algorithms for carrying the problem formulation algorithm into effect, i.e., into an implementation or effective procedure for machine control. The intermediate procedure requisite to this mode of implementation of the machine solution within the industrial context of interest is called *compilation*,

which is accomplished under the machine control of a compiler such as FORTRAN. The result of this intermediate step, i.e., the effective procedure for machine control, rarely matches the result that obtains from the step-by-step optimum design of the special purpose machine by one more knowledgeable of the details of the general purpose machine. In short, some effective procedures are more effective than others.[25]

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[25]The development of special purpose program machines adequate to the task of converting the higher level languages, defined simply as symbolic codes capable of expressing the algorithm as a purported effective procedure in a manner reducing greatly the steps of the coding task, has continued over a period of many years. The history of the task of expanding the codes into suboptimal step-by-step operation codes for defining circuit interconnections which are merely purported effective procedures can be traced by reference to the following:

R.W. Floyd, "Syntactic Analysis and Operator Precedence", *Journal ACM*, Vol. 10, 3 (July 1963), pp. 316-333.

J. Eichel, M. Paul, F.L. Bauer and K. Samelson, "A Syntax-Controlled Generator of Formal Language Processors", *Comm. ACM*, Vol. 6, 8 (Aug. 1963), pp. 451-455.

N. Chomsky and M.P. Schutzenberger, "The Algebraic Theory of Context-Free Languages", *Computer Programming and Formal Systems*, North-Holland, Amsterdam (1963).

B. Randall and L.J. Russell, *ALGOL 60 Implementation*, Academic Press, New York (1964).

E.T. Irons, "Structural Connections in Formal Languages", *Comm. ACM*, Vol. 7, 2 (Feb. 1964), pp. 67-72.

N. Wirth, "Find Precedence Functions Algorithm 265", *Comm ACM*, Vol. 8, 10 (Oct. 1965), pp. 604-605.

N. Wirth, H. Weber, "Euler — A Generalization of ALGOL And Its Formal Definition." Part I, Part II., *Comm. ACM*, Vol. 9, 1 (Jan. 1966), pp. 13-23, 25 and Vol. 9, 2 (Feb. 1966), pp. 89-105, 107.

The first FORTRAN compiler required that an IBM 701 be adapted five distinct times to perform what are referred to as *passes* to produce suboptimally arranged operation codes for machine designers desiring to adapt the IBM 701 to their machine problem to be solved. This work commenced in 1952 and terminated in 1954. The technique was termed heuristic by W. Rutishauser, a word deriving from the German verb *heuriskein*, to invent by empirically determining alternatives. *Webster's New World Dictionary of The American Language*, Second College Edition (1972).

The evolution of a higher level language or, equivalently, translation algorithm, makes it clear that any such language or algorithm must have an efficient physical realization for carrying out an effective procedure for translation. The relationship of translation algorithm (higher level language) to translation effective procedure (implementation of the higher level language) is precisely the same as the relationship of an algorithm descriptive of an industrial context to an effective procedure for machine control within that industrial context. In fact, a *translation algorithm* must become a *translation effective procedure,* because in order that it be commercially viable as a machine, its functioning to carry a *source industrial algorithm* into its related *object industrial effective procedure* must be such that the operations defined for that object industrial effective procedure as well as other object structural definitions formed during compilation, e.g., shared facilities of the general purpose machine, must be more nearly optimal than competitive alternatives.

Typically, one utilizing the facilities of the enhanced or extended machine defined to compile his industrial algorithm over a period of time, and absent a requirement or the interest to "look in" to a greater depth, will avail himself of the best features of that machine. Thus, during the course of his preparation for carrying his industrial algorithm into an effective procedure for machine control, he is concerned with implementation, viz., getting the program machine which defines the effective procedure onto the general purpose machine to define a machine solution to the machine problem to be solved.

The extended/enhanced machine which is used for each and every step of compilation is a machine distinct from that which is to be structured by the fully-tested effective procedure. It is a machine for assisting a machine designer in the design of another machine. In the fully-formed machine, conceived as a distinct industrial algorithm and reduced to practice as a distinct industrial effective procedure for machine control, such control is achieved by hundreds of thousands of unique sequential interconnections of circuits. Thus, a general purpose machine, adapted as a compiler by an Academician responding to application pull, is more like an automatic machine for stamping printed circuits or an automatic lathe for machining parts than a translator of languages as asserted by petitioner (Pet. Br. 29).

The work of the Academician whose activities are within the second cycle, *supra* p. 18, may be described as axiomatic investigation, i.e., seeking a suitable axiomatic structure to define the physical structure of the various machines performing myriad complex computations to provide machine solutions within an ever-expanding industrial context. The search for appropriate techniques of axiomatic investigation is a continuing one. This type of investigation is of a unique character, in that it employs non-numerical mathematics.[26] This uniqueness is

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[26]See Minsky, *supra* note 7, Preface, p. x:

"This really is a branch of mathematics that stems directly from non-numerical, logical foundations . . .

"It is worth a few words to try to explain why classical mathematical analysis plays such a small role here. In developing a Theory of Computation we are trying to deal with systems composed of a great many parts, or *very intricate structures* (emphasis added) . . . .Now it is true that under certain special conditions mathematical analysis can 'revive' as it were, when the situation gets complex in such a way that the parts of the system can be treated as individually and independently random . . . But it must be stated explicitly and emphatically that this is just what does *not* happen when, as in a computation system, the structure has a more organized, purposeful structure . . . There simply is no reason to suppose that as computations grow large, one will discover anything non-trivial by trying to 'average out' the effects of many events. The effect of the conditional is too strong . . .

"Fortunately, the systems of computation have other features that make possible some analysis, though a very different kind . . . we use logically defined classes of computations or expressions. They are tied together not by geometric or energetic properties, but by their relations to similar machines or similar definitions . . ."

reflected by the work of the many pioneers who have defined the nexus between the various techniques of axiomatic investigation.[27]

7. Summary

Invention in the program machine art may reside in conceptualizing a machine with the state of the implementation art in view, in reducing an abstraction to practice in the form of an implementation, or in any of the activities distributed over the various steps of the inventive process, according to the magnitude and complexity of the machine problem to be solved. The technological facts present a logical imperative, viz., that a new program defines a new machine which is either an extended or enhanced general purpose machine such as that of Amicus Universal or a special purpose machine such as that disclosed and claimed in respondent's application. Such new programs which meet the standards set by 35 U.S.C. §§102, 103 should be afforded patent protection[28] under that statute, particularly in view of the

[27]The following are exemplary of pioneer works defining adaptable theoretical structure employing the *axiomatic technique*, i.e., statements of propositions whose truth would be accepted within a framework of the logic of propositions respecting the description of machines not then in existence: Turing, *supra* note 5; S.C. Kleene, "General Recursive Functions of Natural Numbers," *Math Annalen*, 1936), pp. 112, 340-353; A. Church, "The Calculi of Lamda-Conversion", *Annals of Mathematics Studies*, Princeton (1941); E.L. Post, "Absolutely Unsolvable Problems And Relatively Undecidable Propositions — Account Of An Anticipation", M.S. unpublished, 1941, formally published, M. Davis, *The Undecidable*, Raven Press, Hewlett, N.Y. (1965); E.L. Post, "A Variant of A Recursively Unsolvable Problem," *Bull. Amer. Math. Soc.*, Vol. 52 (1946), pp. 264-268.

[28]Even the Solicitor General has publicly acknowledged that "the dynamic interrelationship between . . . computers and the software programs through which they are applied to numerous and varied tasks may call for new measures or legal concepts to further reward and stimulate innovation in programming." *Computerworld*, Vol. IX, No. 33 (August 13, 1975), p. 3.

unsuitability of both trade secret[29] and copyright protection.[30]

C. An Unobvious Idea Can Form A Sound Legal Basis For Patentability Even Though Its Implementation Is Obvious Once The Idea Has Been Grasped.

Petitioner has asserted that even where an idea[31] is not obvious, its implementation must be unobvious as well in order to justify the grant of Letters Patent, whether the implementation involves a process or a product (Pet. Br. 11-12, 22). Paraphrasing the foregoing proposition, petitioner has further asserted that the patent laws require not only the application of the unobvious idea to a new and useful end, but also the exercise of the inventive faculty in both conceiving and devising the end product or process (Pet. Br. 22-23). With these dangerously broad assertions, petitioner threatens a carefully-developed principle which has been firmly established in our patent law by a series of soundly-reasoned judicial decisions handed down over a period of nearly 75 years. This principle may be stated as follows: if a problem is unobvious or the source of a known problem is unobvious, and an inventor has recognized the existence of the unobvious problem or the unobvious source of the known problem, and has conceived and reduced to practice a new product (article, machine, composition of matter) or process which solves the problem, then that inventor may obtain patent protection for the new product or process, even if that product or process is an obvious solution to the unobvious problem after that problem has

[29]Scafetta, *supra* note 22, pp. 395-6. Also see *Computerworld*, *supra* note 28, p. 3, the comment by G. Chatfield on the near-impossibility of maintaining secrecy of proprietary software:

"When a main storage dump is taken, [the software vendor's] code lays in object form in that system. Anyone who is very knowledgeable knows you can do a fairly decent job in 'reverse translating' to get back to at least a pseudosource language. This more or less reveals the concepts, patterns and ideas of the vendor's software."

[30]Scafetta, *supra* note 22.

[31]"Idea" is defined as any conception existing in the mind as a result of mental understanding, awareness, or activity. *The Random House Dictionary of the English Language* (Unabridged Edition) (1966).

been recognized, or is an obvious solution to the known problem after its unobvious source has been recognized. *Hobbs v. Beach,* 180 U.S. 383, 392-3 (1901); *Eibel Process Company v. Minnesota & Ontario Paper Company,* 261 U.S. 45, 67-68 (1923); *General Electric Company v. Hartman,* 187 Fed. 131, 135-6 (1st Cir. 1911); *Application of Hamilton,* 64 F.2d 141,143 (C.C.P.A. 1933); *Application of Hofmann,* 95 F.2d 257, 259 (C.C.P.A. 1938); *Application of Bencker,* 96 F.2d 326, 328 (C.C.P.A. 1938); *Application of Deakins,* 96 F.2d 845, 849 (C.C.P.A. 1938); *Application of Earle,* 102 F.2d 232, 235 (C.C.P.A. 1939); *Application of DeLancey,* 159 F.2d 737, 741 (C.C.P.A. 1947); *Application of Emmey,* 161 F.2d 754, 756 (C.C.P.A. 1947); *Application of Holt,* 162 F.2d 472, 477 (C.C.P.A. 1947); *Application of Bisley,* 197 F.2d 355,363 (C.C.P.A. 1952); *Application of Tanczyn,* 202 F.2d 785, 787 (C.C.P.A. 1953); *Application of Shaffer,* 229 F.2d 476,480 (C.C.P.A. 1956); *Application of Pennington,* 241 F.2d 750, 754 (C.C.P.A. 1957); *Application of Hortman,* 264 F.2d 911, 913 (C.C.P.A. 1959); *Application of Antonson,* 272 F.2d 948, 949 (C.C.P.A. 1959); *Application of Conover,* 304 F.2d 680, 683-4 (C.C.P.A. 1962; *Application of Linnert,* 309 F.2d 498, 501-2 (C.C.P.A. 1962); *Application of Sponnoble,* 405 F.2d 578, 585-6 (C.C.P.A. 1969); *Trio Process Corp. v. L. Goldstein's Sons, Inc.,* 461 F.2d 66, 72 [footnote 18a] (3rd Cir. 1972), cert. denied 409 U.S. 997; *Application of Roberts,* 470 F.2d 1399, 1401 (C.C.P.A. 1973); *Application of Nomiya,* 509 F.2d 566, 571-2 (C.C.P.A. 1975). This principle has been applied not only in decisions by the Courts, but also in administrative decisions by the Patent Office. *Ex parte Phair,* 1 U.S.P.Q. 133, 134 (P.O. Bd. App. 1929); *Ex parte Greider,* 17 U.S.P.Q. 73 (P.O. Bd. App. 1932; *Ex parte Denny,* 65 U.S.P.Q. 523, 524 (P.O. Bd. App. 1944); *Ex parte Harr,* 73 U.S.P.Q. 120, 121 (P.O. Bd. App. 1946); *Ex parte Hemig,* 125 U.S.P.Q. 75, 76 (P.O. Bd. App. 1959); *Ex parte Ligh,* 159 U.S.P.Q. 61, 62 (P.O. Bd. App. 1967); *Ex parte Breidt,* 161 U.S.P.Q. 767, 768 (P.O. Bd. App. 1968). Thus, the

particular manifestation of invention[32] in which the idea or mental aspect is the crucial element from which the remaining elements obviously flow has consistently been found to be a patentable contribution to the useful arts.

The contrary proposition and the various paraphrasings thereof by petitioner are said to be precedented by *Gottschalk v. Benson, supra,* but the cited portion of that decision (67-68) speaks only of a requirement for the application of a newly-discovered law of nature to a new and useful (but not unobvious) end as a prerequisite to issuance of a patent based on the discovery. Thus, petitioner appears to have indulged in an unwarranted extrapolation of *Benson.* Also cited is *Funk Bros. Seed Co. v. Kalo Inoculant Co.,* 333 U.S. 127 (1948), in which product claims drawn to an inoculant for leguminous plants formed by combining mutually non-inhibitive strains of different species of bacteria were held invalid because they were found to be based on the newly-discovered law of nature that certain bacterial strains did not inhibit each others ability to fix nitrogen in specific leguminous

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[32]Three classes of invention are defined in *Rosemary Mfg. Co. v. Halifax Cotton Mills,* 257 Fed. 321 (4th Cir. 1919) as follows:

"In many inventions there are two distinct steps: First, the conception of the general result wished for; second, the discovery of a way of obtaining it. In a large majority of cases, perhaps the first may be obvious to every one interested in a particular art, and it is the second which calls for the exercise of inventive genius. But that is not always so. It may well be that two or more machines, appliances, or tools are old and well known. Some day it dawns on someone that, if they are combined, new and useful results will be obtained. It may be that, so soon as the advantages of the combination are understood, the means of bringing it about are within the capacity of any fairly skilled mechanic. In a third class of cases inventive genius may be required both in perceiving the combination that is desirable, and in finding out a practical way of making it."

plants,[33] not because they were based on an idea. *Armour Pharmaceutical Co. v. Richardson-Merrell, Inc.*, 396 F.2d 70 (3rd Cir. 1968) dealt with product claims drawn to an enterically-coated oral dose of trypsin for systemic treatment of inflammation, the enteric coating being designed to protect the dose as it passed through the acid environment of the gastrointestinal tract until it reached the ileum, where it disintegrated permitting the release of the trypsin dose and its absorption into the bloodstream. Following *Funk*, and noting that the process of enterically coating medicaments was well-known, the Court held the product claims invalid because they were found to be based not on an idea, but on the discovery of the natural phenomenon that the ileum would absorb trypsin. *The Davison Chemical Corp. v. Joliet Chemicals, Inc.*, 179 F.2d 793 (7th Cir. 1950) involved patent claims to a process for making silica gel of low density (and therefore high porosity) in water of higher temperature than taught by the prior art. The utility of the silica gel as a dessicant was thereby enhanced in certain applications. The Court held the claims invalid, not because the invention derived from an idea, but because it was based on the newly-discovered scientific fact that the temperature of the washing water directly affects the density of the silica gel. In *National Lead Co. v. Western Lead Products Co.*, 324 F.2d 539 (9th Cir. 1963), the Court followed *Davison* in affirming the District Court decision invalidating claims to process for continuously produc-

[33]Mr. Justice Frankfurter, concurring in this result on the separate ground of inadequate disclosure, said:

"If this is a correct analysis of Bond's endeavors two different claims of originality are involved: (1) the idea that there are compatible strains, and (2) the experimental demonstration that there were in fact some compatible strains. Insofar as the court below concluded that the packaging of a particular mixture of compatible strains is an invention and as such patentable, I agree, provided not only that a new and useful property results from their combination, but also that the particular strains are identifiable and adequately identified."

Mr. Justice Burton and Mr. Justice Jackson, dissenting, agreed with Mr. Justice Frankfurter that the patentee's combinations of mutually non-inhibitive strains of bacteria satisfied the statutory requirements of invention.

ing a mixture of different types of lead, even though the process yielded superior control over the particle size, composition, and color of the mixture by restricting the mixing pot temperatures to a defined range. The Court found that the invention was based on the discovery of a natural relationship between the temperature of the reaction and the uniformity of product characteristics. In *Loew's Drive-In Theatres, Inc. v. Park-In Theatres, Inc.*, 174 F.2d 547 (1st Cir. 1949), cert. denied 338 U.S. 822, the structure of a drive-in theatre was acknowledged to be appropriate subject matter for a patent, but was found to be obvious as claimed, without giving any weight to the method of doing business in which that structure was intended to be instrumental.

Since only *Loew's* involved an invention which appears to be based upon an idea, and that relating to a method of doing business rather than a scientific or technical insight, petitioner's sweeping proposition is only narrowly supported by one case. It is noteworthy that the legal basis for the later decisions (except *Loew's*) derived largely from *Funk*, in which this Court was sharply divided.[34] In any event, all of these cases may be distinguished from those cited by Amicus Universal in that the discoveries in the latter cases were in a specific technological context, i.e., they were discoveries of deficiencies or problems or the sources of problems in the prior art, rather than discoveries of scientific principles *per se*. On this basis, it is urged that petitioner's excessively broad statement of what *Benson*, *Funk*, *Armour*, *National Lead*, *Davison*, and *Loew's* stand for be rejected so as to leave intact the soundly-reasoned body of law cited by Amicus Universal.

[34]Concerning the analysis in *Funk*, Mr. Justice Frankfurter, in his separate concurring opinion, *supra*, note 33, observed that:

"It only confuses the issue, however, to introduce such terms as 'the work of nature' and the 'laws of nature', for these are vague and malleable terms infected with too much ambiguity and equivocation. Everything that happens may be deemed 'the work of nature', and any patentable composite exemplifies in its properties 'the laws of nature'. Arguments drawn from such terms for ascertaining patentability could fairly be employed to challenge almost every patent."

To the extent that the few decisions cited by petitioner might be deemed to be inconsistent with the great weight of contrary authority cited by Amicus Universal, it is urged that the latter is more in keeping with the concept behind our patent system, viz., rewarding those inventors who make the knowledge of their technological advancements available to the public. An inventor who has made a contribution to the understanding of the useful arts should not be denied patent protection for an invention stemming from that understanding. To make an inquiry into the unobviousness of an invention without considering its conceptualization seems too narrow a view. Even if an invention might be readily carried out after forming its conceptualization, and even if that conceptualization begins with a newly-discovered scientific principle, the grant of a patent for a limited number of years does not seem too great a reward for the discovery and dissemination of a scientific principle which is eternal.

V

CONCLUSION

For the foregoing reasons, the judgement of the Court of Customs and Patent Appeals should be affirmed.

Respectfully submitted,

Charles Winn Sims
2208 Piedmont
Wichita Falls, Texas 76308

Counsel for Amicus Curiae

Of Counsel:

Francis Noel Carten
Carten & Sims
500 Summer Street
Stamford, Connecticut 06901

32 Broadway
Suite 514
New York, New York 10004

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IN THE

Supreme Court of the United States

October Term, 1974.

No. 74-1033.

C. MARSHALL DANN, Commissioner of Patents & Trademarks,
Petitioner,

v.

THOMAS R. JOHNSTON,
Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR THE AMERICAN PATENT LAW ASSOCIATION.

ARTHUR R. WHALE, President,
American Patent Law Association,
2001 Jefferson Davis Highway,
Arlington, Virginia. 22202

RICHARD E. KURTZ,
1831 The Fidelity Building,
Philadelphia, Pennsylvania. 19109

JAMES W. FALK,
HOWARD POPPER,
600 Mountain Avenue,
Murray Hill, New Jersey. 07974

BARRY E. SAMMONS,
780 North Water Street,
Milwaukee, Wisconsin. 53202

JACK C. GOLDSTEIN,
2100 Transco Tower,
Houston, Texas. 77027

Attorneys for Amicus Curiae, The American Patent Law Association.

International Printing Co., 711 So. 50th St., Phila., Pa. 19143 — Tel. (215) 727-8711

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C. MARSHALL DANN, COMMISSIONER OF PATENTS & TRADEMARKS,

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ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

—

BRIEF AMICUS CURIAE FOR THE AMERICAN PATENT LAW ASSOCIATION.

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I.

THE NATURE AND THE INTEREST OF THE AMICUS.

A. The American Patent Law Association.

This brief amicus curiae is submitted by the American Patent Law Association ("APLA")[1] under Rule 42(2) of

1. APLA's membership-at-large elects the officers and other who form APLA's 19-member governing body, the Board of Managers. The filing of this brief on behalf of APLA has been authorized by the Board of Managers and approved by its Executive Committee.

this Court. Letters from the parties' counsel, consenting to the filing of this brief, are on file with the Clerk of this Court.

APLA is a nationwide association of approximately 4,000 members including judges, law teachers, copyright and trademark lawyers, and over half the patent lawyers in the country from private, corporate, and government practice.

Unlike some specialties of law practice where the plaintiffs and defendants are often represented by predominantly separate legal fraternities, in patent law the same individual attorneys may appear as often on the plaintiff's side as on the defendant's side of patent, trademark and copyright litigation, and on either the licensor or licensee side of negotiations for licenses. By such experience and membership composition, this association is well balanced in the realities of the patent law in action.

B. Interest of the Amicus.

APLA has no interest in and takes no position with respect to the patentability of the particular invention of respondent's pending patent application. More particularly, no position is taken with respect to the issue of unobviousness of the claimed subject matter.

Amicus submits that this case should be decided in accordance with established principles of patent law. Amicus is concerned that the Government's brief tends to confuse some of these established principles.

II.

SUMMARY OF THE ARGUMENT.

A. The inclusion of a programmed digital computer in the enabling disclosure of a patent application claiming an innovation neither confers upon nor removes from that innovation the quality of being a patentable invention. Programmed digital computers are used to implement many different innovations. Patentability of these innovations should be determined in accordance with well established principles of patent law and not by sweeping pronouncements of special law developed from consideration of one or two particular cases.

B. Where the inventor's idea for an invention is novel, unobvious and in the technological arts, the idea is part of the invention as a whole and must be considered in determining the unobviousness of the invention.

C. When a patent has expired on a specific apparatus, such as a computer, only that apparatus and not patentable improvements thereon will "fall into the public domain."

D. Amicus agrees with the three-part view expressed in the Government's Reply Brief for Certiorari that recognizes "the possibility of patentability if a program co-acts with an ordinary computer in a 'synergistic' way, if the program is carried out with newly-inventive apparatus, or if a program produces a new use for an old machine sufficiently inventive to be patentable as a process." (G. Rep. 2).[2] Amicus is concerned however, that the Government's subsequently filed main brief has qualified that view so as to render it meaningless.

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2. G. Rep. refers to the Government's Reply Brief for Certiorari. G. Br. refers to the Government's main Brief.

E. The claims of a patent application are the true measure of a patent grant. The Government ignores respondent's claims and instead focuses on the alleged underlying programming idea. "Program" is not well defined in this case and the patentability of "programs" per se is not an issue. Computer technology has already advanced so far that the Government's oversimplifying "programming" analogies are meaningless.

III.

ARGUMENT.

A. The Inclusion of a Programmed General Purpose Digital Computer as Part of the Enabling Disclosure of a Patent Application Claiming an Innovation Neither Confers Upon Nor Removes From That Innovation the Quality of Being a Patentable Invention.

The first paragraph of 35 U. S. C. § 112 requires that the applicant disclose his innovation in terms which enable a skilled person to practice the invention. That is, the applicant must submit an "enabling disclosure."

The inclusion of a properly programmed digital computer as part of the enabling disclosure of a patent application cannot be determinative of patentability because computers are used to implement patentable innovations in the useful arts, and they are used to implement unpatentable innovations in the liberal arts. Digital computers are used to perform mathematical calculations, compose music, make fine arts drawings, operate factories and warehouses, refine oil, generate electric power and perform numerous other tasks.[3] No general rule can justly describe the patentability of all of the foregoing.

Nevertheless, Petitioner's first question on page 2 of its brief is based on the premise that this Court in

3. "Digital Control and Automation Systems—A look at Computer Control and Automation in Automative Manufacturing," *Computer Design*, October, 1973; "How real-time computers work in today's automatic warehousing," *Material Handling Engineering*, January, 1975; "Refinery operations controlled by double computer," *Petroleum Review* 27, 471-6 (1973); "DEH: The computer takes over turbine control," *Power*, August, 1973; "Digital Control and Automation Systems—System Measures and Sorts Green Lumber at 38 Boards/Min. with 99.5% Accuracy," *Computer Design*, July, 1974.

Gottschalk, Acting Commissioner of Patents v. Benson et al., 409 U. S. 63 (1972), held that a new idea implemented by programming an existing computer is unpatentable. Petitioner seeks extension of a decision that the method claims in that case were unpatentable to a holding that the apparatus claimed in the present case is unpatentable.

However, the only similarity between the present case and *Benson* is the presence of a general purpose digital computer in the enabling disclosure of the involved patent application.

To adopt the Government's interpretation of *Benson* and the extension thereof to apparatus claims would preclude patenting innovative machines in the arts which have hitherto prospered under the patent system.

The Government's First Question Is Based On A Fallacy Because Benson Did Not Rule Out Process Claims For All Inventions Wherein Programming Is Part Of The Enabling Disclosure.

The *Benson* patent application disclosed a mathematical technique that could best be performed by using an appropriately programmed digital computer. This Court found the claims of the *Benson* application so broadly written and so unlimited in scope as to pre-empt the underlying mathematical discovery itself. The *Benson* claims were the same type of "overweening claim" that had been struck down in *O'Reilly v. Morse*, 56 U. S. (15 How.) 62 (1853). The *Benson* claims were "not limited to any particular art or technology, to any particular apparatus or machinery, or to any particular end use" and pre-empted the "algorithm itself." 409 U. S. 63, 72.

However, the presence of a "computer" or a "program" is not determinative of whether a claim should be struck down for over-breadth as by pre-empting an algorithm. The proper test, as indicated by this Court's decisions in *Morse* as well as in *Benson*, is whether a nonstatutory "idea" such as a mathematical algorithm is being claimed so broadly that the claim is, in effect, attempting to pre-empt the nonstatutory idea itself.

The claims to the algorithm of *Benson* would have been no more or no less patentable if the process set forth in those claims had been based on a disclosure of a known wired machine or analog computer. Similarly, apparatus claims supported only by a disclosure of known apparatus acting in a known way to perform a mathematical algorithm and of such breadth as to preempt the algorithm itself are not statutory regardless of whether a "program" or "general purpose computer" is or is not included in the enabling disclosure.[4]

APLA therefore suggests to this Court that the question of the patentability of programs or of inventions based upon an enabling disclosure including a programmed computer is irrelevant to the resolution of this appeal.

B. Where the Inventor's Idea for an Invention Is Novel, Unobvious, and in the Technological Arts, That Idea Is Part of the Invention as a Whole and Must Be Considered in Determining the Unobviousness of the Invention.

Whatever the decision of this Court on the immediate issue of patentability of the invention claimed here, it is

4. One cannot look at the hypothetical Benson claim prepared by the Government and set out in Appendix D of its Petition, by itself, to determine whether in scope it is overclaiming so as to cover the algorithm itself. With a sufficient supporting disclosure showing the specific apparatus elements involved, the claim presented by the Government is a proper claim. How broadly the claim will be interpreted in an infringement situation on someone else's structure is a question of equivalency that may or may not be established in the particular facts of the case.

imperative that the rationale on page 22 of the Government's brief be discarded. The Government argues that:

> "Even when an idea is unobvious its implementation must be unobvious, as well, to justify the grant of a patent monopoly, whether the implementation involves a process or a product." (G. Br. 22)

The brief further states that the "means or mode of implementing the idea must extend beyond the routine, conventional or obvious applications of the idea that follow once the idea is known." The argument is completely contrary to the established principle, codified in 35 U. S. C. § 103, that the invention as a whole must be considered in determining patentability.

Does the Government contend that the inventor's idea is prior art to the apparatus or process for carrying it out? That this contention is antithetical to the law of patents is to be noted from the thousands upon thousands of patents granted on electrical, mechanical and chemical inventions in which the way of implementing the idea is perfectly clear from the idea itself.

This Court, in *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U. S. 45 (1923), treats one facet of the question. There the patentee discovered that wrinkling and malformation of paper in a paper making machine occurred because the stock did not flow fast enough at a critical point in the process. Eibel simply increased the pitch of the path of the stock to take advantage of the force of gravity to increase the flow rate. This Court held the patent valid, deciding that the patentee had made a patentable contribution in discovering the problem even though the solution was deemed to be routine. Certainly in the *Eibel* case the "invention as a whole" was considered in determining patentability.

Since at least as early as the *Eibel* case, the "invention as a whole" has been referred to in determining patentability.[5]

The Government's brief obscures the issue in its faulty analysis at page 22 of its brief. There are at least three distinct situations involving an idea and its implementation, and the Government has chosen to see only two of them. Basic to an understanding of the misconception that can result is the distinction between "obviousness" and the constitutional consideration requiring that the invention relate to the "useful arts."

The first situation is where the idea does not directly relate to the useful arts and the implementation is claimed so broadly as to cover all uses of the idea or is claimed so as to cover the obvious uses of the idea. Ideas not directly related to the useful arts include recognition of a law of nature or a mathematical algorithm. For this situation, patent coverage is not permitted. Examples of this are *Benson, supra,* and *Funk Bros. v. Kalo Inoculant Co.*, 333 U. S. 127 (1948).

The second situation is where the idea is not directly related to the useful arts but the implementation of that idea is claimed to cover unobvious mechanisms or processes in a useful field. Then patent coverage is possible, *Mackay Radio & Telegraph Co. v. Radio Corporation of America*, 306 U. S. 86, 94 (1939). In this situation the "patent monopoly may be granted, not on the idea, but on the inventive process or product." (G. Br. 24).

The third situation, totally ignored in the Government's brief, is where the idea relates to the useful arts

5. See also, *Trio Process Corporation v. L. Goldstein's Sons, Inc.*, 461 F. 2d 66, n. 18a (3 Cir. 1972); *In re Aufhauser*, 399 F. 2d 275, 277 (CCPA 1968); *In re Conover*, 304 F. 2d 680, 683 (CCPA 1962); and *In re Roberts and Burch*, 470 F. 2d 1399, 1401 (CCPA 1973).

and is unobvious. It must then be considered as part of the "subject matter as a whole," 35 U. S. C. § 103. In this situation it is erroneous to give weight to the obviousness or unobviousness of the *implementation*. The *Eibel* case, *supra*, is in point. There, having analyzed the problem in terms of an unobvious idea or discovery, the implementation was obvious, but the patent was upheld in view of the unobviousness conferred through the discovery.

The Government in its brief has created the possibility for considerable mischief in the patent law by improperly expanding the limited holding of *Funk Bros., supra*, to produce a rule of law that encompass all inventions, not only those directed to natural phenomena.[6]

The fallacy of the broad pronouncement that in all instances the means of implementing an idea must be unobvious can be seen from this Court's decision upholding the patent in *U. S. v. Adams*, 383 U. S. 39 (1966). Here, again, the implementation required only ordinary skill, but it was the idea that imparted patentability to the claims in the Adams patent. As this Court stated in *Graham et al. v. John Deere Co. of Kansas City et al.*, 383 U. S. 1, 32 (1965), it is the invention as a whole that must be viewed in determining patentability and the whole encompasses both conception and implementation.

It may not be clear whether the Government intended this sharp redirection in the law of patents, but it is certain that destructive violence would be worked on the statute and on the patent system itself should the Government's "rationale" be adopted by this Court.

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6. The Court of Appeals in *Armour Pharmaceutical Co. v. Richardson-Merrill, Inc.*, 396 F. 2d 70, 74, read the opinion in *Funk* to lead to "the test of patentability of a natural phenomenon" and not to a test of patentability for all inventions, as stated by the Government in its brief.

C. When a Patent on a Specific Apparatus, Such as a Computer, Has Expired, Only That Apparatus and Not Patentable Improvements Thereon Will "Fall Into the Public Domain".

The Government has noted two truisms in patent law but it has to come to a conclusion not supported by either truism, by any logic or citation of authority. First, the Government has noted (G. Br. 35) that when a patent expires its subject matter falls into the public domain. Second, the Government has noted (G. Br. n. 27) that an inventor of a machine is entitled to the benefit of all uses of that machine. However, it is a complete non-sequitur to go from these two basic statements to the Government's contention that all inventive improvements utilizing a previously patented computer must fall into the public domain with the demise of the first patent on that computer.

The obtaining of a patent on a machine does not prevent others from obtaining patents on unobvious improvements on the machine, on an unobvious combination incorporating the machine as one element of the novel combination, or on new and unobvious uses of the machine. Such later patents are permitted under 35 U. S. C. §§ 100-103 whether that machine is the subject of an expired or unexpired patent or had never been patented.

When a patent expires the invention which is claimed in that patent falls into the public domain. By refusing throughout its argument in this case to consider patent claims, the Government has failed to distinguish between the claimed invention of a patent and the commercial equipment which incorporates that invention and brings the invention to the market place. That which is claimed in the patent falls into the public domain on the expiration of the patent. Whether or not the commercial equipment

also falls into the public domain is dependent upon whether other valid and unexpired patents are applicable to that specific equipment.[7]

A patent on an improvement invention does not withdraw from the public its right of free access to materials already available (G. Br. 36). The public's access to the unimproved apparatus, here the computer, is in no way impaired by patents that may issue on novel improvements to that computer. Only the public's access to the improvement invention is temporarily subject to the patent, but that improvement invention is perforce not already available within the public domain.

An improvement which is truly unobvious may merit the praise accorded by this Court to Eibel's paper-making invention:

> "His was not a pioneer patent, creating a new art; but a patent which is only an improvement on an old machine may be very meritorious and entitled to liberal treatment. Indeed, when one notes the crude working of machines of famous pioneer inventions and discoveries, and compares them with the modern machines and processes exemplifying the principle of pioneer discovery, one hesitates in the division of credit between the original inventor and the improvers; and certainly finds no reason to withhold from the really meritorious improver, the application of the rule 'ut res magis valeat quam pereat' which has been sustained in so many cases in this Court." (261 U. S. at 63)

7. There are proper aspects of the problem of the "second and further partial monopoly" (G. Br. 35) where a second patent is obtained on a product already the subject of a prior patent. In *Brulotte v. Thys Co.*, 379 U. S. 29 (1964), this Court had before it a situation where seven patents were incorporated into the licensed machines. The Court held that it was improper to collect royalties "which accrued after the *last* of the patents incorporated into the machine has expired," 379 U. S. 30 (emphasis added). According to the argument presented by the Government in this case, the collection of royalties after the *first* of the patents incorporated into the machine had expired should have been illegal.

The Government's brief suggests that a patent on a novel and unobvious improvement of apparatus previously patented by someone else should be invalid, per se, as an extension of the first patent. The proper question has always been whether the improvement is obvious or unobvious under 35 U. S. C. § 103 in view of the prior patent and all other pertinent prior art. It is interesting to note that under the Government's view one would never reach the § 103 issue if there is a prior patent, expired or unexpired, which discloses the apparatus on which the present invention is an improvement.

When the patents covering the computer used to implement respondent's invention herein expire, the claimed subject matter of those patents will fall into the public domain. But there is neither reason nor authority to support the Government's ill-founded contention that all patentable improvements of such computers, whether machine or process inventions, and whether or not involving programming as part of their enabling disclosure, must also fall into the public domain.

D. An Innovation in Digital Computer Programming May Be Patentable if the Program Co-Acts With an Ordinary Computer in an Unobvious Way, if the Program Is Carried Out With Newly Invented Apparatus or if the Program Produces a New Use for an Old Machine Sufficiently Inventive to Be Patentable as a Process.

APLA submits that the foregoing statement requires nothing more and nothing less than an analysis of the type set forth in *Graham v. Deere, supra*. Though it is a

difficult analysis, it has, nevertheless, been carried out with only minor variations since the time of Thomas Jefferson, as set forth in *Graham v. Deere*.

The Court has been asked to make such an analysis under 35 U. S. C. § 103 in the present case. Amicus expresses no opinion on the issue of obviousness except to point out that all inventions, including those in which a programmed computer is included in the enabling disclosure of the invention, must be measured by the same statutory standards including 35 U. S. C. § 103.

Amicus disagrees with the Government's view (G. Br. 14) that the questions of statutory subject matter and obviousness are "interrelated." These are separate questions and should be decided in the sequence which would best serve public policy and judicial economy. Whether an invention is obvious or not can have no bearing on whether the subject matter of that invention is or is not statutory. If this were not true, an invention might be "statutory" at its creation, but rendered "non-statutory" rather than merely "unpatentable" after it had passed into the public domain. But "statutoryness" has never before been thought to be a simple function of the passage of time. Accordingly, "obviousness" and "statutory subject matter" are quite separate, independent and *not* interrelated questions.

Although Petitioner argues that the innovation in the instant application is obvious under 35 U. S. C. § 103, Petitioner recognizes the possibility of patentability in other cases if the program co-acts with the computer in an unobvious way (G. Br. 29). The head-note of this section is a statement from the Government's Reply Brief for Certiorari, p. 2.[8] Although that reply brief recognizes

8. In paraphrasing the Government's position, APLA has used the term "unobvious" instead of "synergism" since the former term appears in 35 U. S. C. § 103.

the possibility of patentability if a computer program produces a new use for an old machine, in its main brief the Government asserts that a new use of a computer is not patentable. The Government argues that this Court in *Benson* held process patents unavailable for inventions involving programs for general purpose digital computers and extends this "holding" to new uses for such computers which must be claimed as a process (G. Br. 27). The fallacy in Petitioner's changed position is that this Court did not hold process patents unavailable for *all* programming related inventions as previously discussed. The question of new uses was not an issue in *Benson* nor is it an issue in the present case.

E. The Government Has Misused Established Principles of Patent Law in Failing to Focus on the Claims and Has Failed to Define Properly the Terms Used.

The claims of a patent are the measure of the patent grant, *Graver Tank & Mfg. Co., Inc. v. Linde Air Products Co.*, 336 U. S. 271, 277 (1949), *Aro Mfg. Co., Inc. v. Convertible Top Replacement Co., Inc.*, 365 U. S. 336, 339 (1961). The Government appears to dismiss that which is claimed as nothing more than a mere matter of form. It characterizes claim language as "inventive semantics" (G. Br. 29). The Government focuses on the "monopoly on [the] *idea* that respondent seeks" (G. Br. 11); respondent's "programming idea" (G. Br. 13); respondent's "alleged inventiveness or novel discovery" (G. Br. 17); and respondent's "alleged invention" (G. Br. 18) without coming to grips with what respondent has claimed. What has been claimed by respondent must be examined as it was examined in *Benson*. The *Benson* decision was not one based on the mere "format" of the claim but, on the contrary, it was based on the entire context of the claims.

In trying to make the complex sound simple, the Government has drawn several misleading analogies. For example, it has argued that "[s]imply put, the difference between a general purpose digital computer . . . and a fixed wire computer is like the difference between a player piano and a music box, respectively." (G. Br. 16). The analogy is wrong for a number of reasons.

The technology has advanced to the point where most of the Government's distinctions between the fixed wire computer and the general purpose digital computer are obsolete. Examples of this include "minicomputers" and "microcomputers," machines which have the attributes of both general purpose and fixed wire computers.

"Minicomputers" are much smaller than the IBM 1400 disclosed in respondent's patent application.[9] Because of its relatively low cost, the minicomputer has found wide application as a substitute for mechanical, electromechanical, analog electrical and digital electrical systems commonly used in industry. Once the minicomputer is programmed to serve a particular function in an industrial system, the program usually remains unchanged. The minicomputer effectively becomes a special purpose computer, and performs like the fixed wire computer referred to in the Government's brief. The choice of whether an innovation should be embodied in a programmed minicomputer or in a fixed wire computer often turns on economic considerations.[10]

More recently, another form of general purpose digital computer has become commercially available which is smaller and lower in cost than the minicomputer. Aptly

9. "Minicomputers that run the factory," *Business Week*, December 8, 1973; "Now minicomputers run machine tools," *Business Week*, August 12, 1972.

10. "Hard-wired numerical controllers yield to efficient minicomputers," *Electronics*, April 12, 1973.

termed "microcomputers," these machines are formed by combining a semiconductor read-only memory with an integrated circuit microprocessor.[11] The read-only memory has components which may be embraced within the volume of a postage stamp and which may contain tens of thousands of items of information. It performs all of the functions of the changeable "core" program storage unit of conventional digital computers. Changing the "program" in a machine using a read-only memory requires insertion of a physically different memory element. This is a rearrangement of parts into a new combination. Combinations of physically different parts causing a machine to exhibit a new, useful and non-obvious "rule of action" have always been recognized as giving rise to patentable invention.[12]

The music box, player piano analogy is not applicable to programmable digital computers for another reason. Every machine is characterized by its rule of action which resides within the machine itself. Robinson, *The Law of Patents*, §§ 173 and 175 (1890). Machines that are different can be characterized by the different rules of action

11. "Microcomputers—Evolutionary successor of the minicomputer, the microcomputer is a set of microelectronic 'chips' serving the various computer functions. It has opened up new realms of computer applications," *Scientific American*, May, 1975; "Computers: First the Maxi, Then the Mini, Now It's the Micro," *Science*, Vol. 186, December 20, 1974; *IEEE Transactions on Industrial Electronics and Control Instrumentation*, Vol. IECI-22, No. 3, August, 1975, pp. 290-360; "News Scope—$15 microprocessor coming for simpler applications," *Electronic Design*, August 16, 1975; "Microprocessor Sparks a Quiet Revolution in Instrumentation," *Electronic News*, Vol. 20, No. 1039, August 4, 1975; "Microprocessors & minicomputers: what will the future bring?", *EDN*, November 20, 1974.

12. The Government (G. Br. 15) acknowledges that by using a different program in a computer "the configuration of its circuitry can be readily changed." Such new and unobvious configurations of circuitry have always been within the scope of the patent statutes.

resident in each. The rule of action of a music box is to have its steel comb plucked by the spikes set into its rotating drum; the rule of action of a player piano is to have its keys actuated according to the pattern of holes punched in its paper roll. Each type of machine plays the "music" by slavishly striking the note identified by the spike on the drum or the hole on the paper. Though each machine can be characterized by more detailed rules of action spelling out its particular distinctive instrumentalities, both machines can be characterized on a broader level, by the common rule of action: "strike the identified note." Thus, when a "new" drum or paper roll is inserted that differs from the "old" drum or paper roll solely because of the musical significance contained, the "rule of action" of neither machine is changed. Though there might be an advance in the art of music from a paper tape of "Chopsticks" to a paper tape of a Sousa march, the change is not in the rule of action of the machine but only in the fine art of music.

This is not the case with computers. The advent of the programmable digital computer made available for the first time a machine having a truly changeable "rule of action."[13] In the music box or player piano, only notes could be struck. The digital computer is so flexible that it can run entire chemical processing plants or make connections for transcontinental telephone conversations. For each of these different situations machines with different "rules of action" are required. In each case the "rules" are encoded in the computer memory merely by patterns of "bits." The Government wrongly asserts that these vastly different technologies differ from each other only by "the meaning one chooses to assign outside the com-

13. "Programmable devices—Your best buy in control?", *Modern Materials Handling*, February, 1975.

puter to a particular configuration of binary digits or 'bits' in its memory." (G. Br. 7, quoting the Board).[14]

From the above it can be seen that in this case both the term "computer" and the term "program" have not been well defined even though they are central to the Government's argument. The Government (G. Br. 15) notes that there are systems programs and application programs and then indicates that it is the application program that "is generally denoted by references to computer programs in common parlance." Their brief then assumes that one is only talking "in common parlance."

Amicus CBEMA in its brief (n. 3), also discusses systems programs and applications programs but considers that a system program is "an integral part of the computer." APLA concurs and considers that a computer is a unique combination of electrical components interconnected by that "integral part," the requisite programs that determine the basic operations, the "rule of action" of the computer.

The rule of action may be permanently incorporated or wired into a machine; it may be permanently but alterably incorporated, as by the use of the semiconductor read-only memory; or it can be transiently incorporated, as by reading into a memory certain bit states for the elements of that memory. A "fixed wire computer" and a "general purpose computer" (G. Br. 16) are again undefined terms.

14. A programmable digital computer has more than a mere array of "notes" which may be struck for each binary "bit" in its memory unit. It typically has a whole array of otherwise unrelated logic devices and peripheral units which are organized only when the "program" is loaded and run. Unprogrammed, the machine has been correctly analogized to a mere storehouse of parts. Applying the *Robinson* criteria, an unprogrammed computer has *no* rule of action or at best only a simple rule of action which makes it capable of interacting with a program which is fed into it. This is the correct import of the Bernhart "doctrine," (G. Br. 33) which is more accurately a statement of technological fact than a legal doctrine.

Both terms can apply to a digital computer (contrary to the implications of footnote 14, G. Br. 15). And both terms can apply to a computer with a read-only memory. By speaking "in common parlance" the Government confuses, not clarifies, the issue.

IV.
CONCLUSION.

The Government's first question (G. Br. 2) assumes that *Benson* held process patents unavailable for all programmed operations of a computer. This assumption is erroneous and cannot be the basis for the sweeping pronouncement of unpatentability of programmed apparatus which the Government propounds.

By this question and other statements in its brief the Government confuses, not clarifies, the issues. The legal principles to be applied are not dependent on the presence or absence of programming in the enabling disclosure.

The question of the patentability of programmed machines and programmable processes should be dealt with in the same way as with identical questions that would arise with any other types of machines or processes.

The inventor of a new, useful and unobvious process or apparatus should not be deprived of the incentives of the patent statutes merely because his invention uses program control in its implementation.

Respectfully submitted,

RICHARD E. KURTZ,
JAMES W. FALK,
HOWARD POPPER,
BARRY E. SAMMONS,
JACK C. GOLDSTEIN,
Attorneys for Amicus Curiae, The American Patent Law Association.

ARTHUR R. WHALE,
President,
American Patent
Law Association.

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IN THE

Supreme Court of the United States

October Term, 1975
No. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS & TRADEMARKS,

Petitioner,

vs.

THOMAS R. JOHNSTON,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

BRIEF AMICUS CURIAE FOR CALIFORNIA PATENT LAW ASSOCIATION.

REED C. LAWLOR,
412 West Sixth Street,
Los Angeles, Calif. 90014,
Attorney for Amicus Curiae.

Of Counsel:
THEODORE H. LASSAGNE,
Hilton Center Office Building,
900 Wilshire Boulevard, Suite 1000,
Los Angeles, Calif. 90017,
DAVID E. LOVEJOY,
160 Sansome Street, 15th Floor,
San Francisco, Calif. 94104,
SAMUEL STONE,
800 Wilshire Boulevard, Suite 900,
Los Angeles, Calif. 90017,
JOHN P. SUTTON,
Suite 3000, Ferry Building,
San Francisco, Calif. 94111.

Parker & Son, Inc., Law Printers, Los Angeles. Phone 724-6622

Service of the within and receipt of a copy thereof is hereby admitted this ..... day of September, A.D. 1975.

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BRIEF AMICUS CURIAE FOR CALIFORNIA PATENT LAW ASSOCIATION.

I.
The Question.

Whether claims in the form authorized by 35 USC 112, to a machine embodying an invention meeting the statutory conditions for patentability of 35 USC 102 and 103, are unpatentable under 35 USC 101, solely because the claimed invention can be embodied in a general purpose computer modified by programming it to function in a specified manner.

II.

Interest of the Amicus.

The California Patent Law Association is an organization of lawyers representing inventors in California. Its members have no special interest in the outcome of this case as far as the particular invention is concerned, but are concerned about the impact of this case on the development of the law. Our members are patent attorneys, both corporate and private; trial lawyers who act one day for a patent owner and the next day against the patent owner; as well as practitioners of all other aspects of the specialty of patent law. Again, in the year 1974, California leads the nation in the number of patents granted to its inventors. The great majority of these patents were prepared by members of our association. The largest state having the largest number of patents granted to its inventors, is also the home of the largest state-wide organization of patent lawyers. Our interest in this case is simply just and proper protection for inventions, no more and no less.

We approach this matter on the side of the respondent because we believe patent protection should be granted to any invention which satisfies the statutory criteria for patentable subject matter.

The California Patent Law Association is interested in even-handed administration of the patent law without regard to the technology out of which an invention arises. An invention is not excluded from the classes of inventions recited in 35 USC 101 merely because it relates to a computer or a computer program.

III.

Consent.

The California Patent Law Association has received consent from both parties to file this brief amicus curiae. The letters of consent have been filed with the Clerk of the Court.

IV.

Summary of Argument.

It is important that the question of what constitutes *statutory* subject matter under 35 USC 101 be distinguished from the question of what constitutes *patentable* subject matter under 35 USC 102 and 103. Even a claim that is not patentable may still define statutory subject matter.

The issue presented by this case that concerns amicus curiae is whether the claims presented in the application define a machine within the statutory meaning of 35 USC 101. Although Petitioner appears to contend that machines which are related to computers or computer programs should be treated differently from all other machines, the claims clearly define a machine.

A means-plus-function claim, expressly recognized as proper under 35 USC 112, does not cover a mental process or an idea as such, but only the implementation of the function by a mechanism or device, that is a machine.

Programming of calculators is a long-known technology. Calculators have been programmed mechanically to perform the addition, subtraction, multiplication,

and division algorithms of arithmetic for hundreds of years. The art of programming the operation of other machines by various temporarily installed mechanical means, such as punched tapes and decks of punched cards, is more than 300 years old. The programming of general purpose digital computers by the use of stored programs, such as replaceable punched tapes and punched cards, was first conceived about 140 years ago and first put into practical use before 1944. Such programming is excitingly different and more advanced than programming with only gears, levers, cams, etc., and opens up vast areas of invention.

When a program device, such as a deck of program cards, is combined with a modern general purpose digital computer, the computer is transformed into a machine that is different from the original general purpose computer. In this process, the states of memory elements, such as magnetic cores, electromechanical relays, or the voltages on electronic elements in the old computer, are transformed, creating a new interdependence between those elements and the rest of the computer and external devices. Unlike a player piano that merely translates holes in a paper roll into sounds on a one-for-one basis,* such a newly programmed general purpose digital computer is a new machine and has new properties and is capable of performing new functions when later supplied with signals that represent data to be processed.

**White-Smith v. Apollo*, 209 U.S. 1 (1907).

Every invention, before it may be patented, must be novel and unobvious, in view of everything which has been done beforehand, that is, in view of all of the prior art. For new and improved machines, whether they be digital computers or the special purpose electronic computers which are created, or manufactured, when new programs are incorporated in them, each machine must be judged against the prior art. That art includes prior computers, prior computer programs, and prior programmed computers. Each new machine warrants patenting, if it passes muster on the criteria established by Congress in Title 35 of the U.S. Code.

This court in *Gottschalk v. Benson*, 409 U.S. 63 (1972), correctly held that the subject matter there presented was not properly claimed. That holding should not be expanded here to state that a programmed computer does not constitute statutory subject matter under 35 USC 101 and that it is not capable of being patented even if the other requirements of the patent statute are met.

The main focus of this case should be on whether a new machine is created by programming a computer in order to provide the structure to perform specified functions. Computer-related machines should not be classified as non-statutory subject matter unless Congress so requires. The present law includes no such artificial classification.

V.

The Claimed "Machine System" Is a Machine Under 35 U.S.C. 101.

The claims presented in this case are detailed recitations of parts and means for performing specified functions. Claims may incorporate elements ". . . expressed as a means . . . for performing a specified function with the recital of structure . . ." 35 USC 112. As such, they should be considered to be the proper subject matter for a patent, in the field of computer technology just as they are in other fields, and the determination should then be made as to whether the claims meet the conditions for patentability.

Petitioner, however, asks this court to stop at the threshold question of whether the "machine system" is a machine. It is Petitioner's contention that the subject matter of the claims is not a machine at all, but an abstract intellectual concept not represented in a concrete form (Brief p. 21). The Petitioner refuses to recognize that apparatus claims written in means-plus-function form cover only the physical machine disclosed in a patent application and equivalents thereof. The principle that abstract ideas are not patentable is sound and well-established in the cases reviewed in *Gottschalk v. Benson*. But the principle has no application to this case.

Benson questioned whether the invention there presented was properly claimed as "a 'process' within the meaning of the Patent Act", 409 U.S. 63 (1972), and found that it was not properly claimed because the claims were too abstract under the guidelines of Supreme Court cases of the last century.

The invention presented here is concrete and not abstract. Unlike *Benson*, the apparatus claimed here is not broad enough to cover a "scientific truth or mathematical expression of it". *Mackay Radio & Telegraph Company, Inc. v. Radio Corporation of America*, 306 U.S. 86, 94 (1939). Computer programs and computers may, if properly defined, be concrete and not simply mathematical formulae. They should be no more and no less patentable than any other inventions. There should be no special rules for programmed computers or programming of computers as opposed to other categories of inventions, just as there are no rules special to catalysts, enzymes, and the like.

The government criticizes the court below for elevating form above substance in limiting *Benson* to processes and distinguishing the present apparatus claims. Yet the government itself places form above substance in characterizing the invention here presented as an "idea", rather than an invention. An idea may be an invention and it may be patentable if it is concretely defined within the guidelines laid down by Congress in 35 USC 112. If the idea is not expressed in concrete terms, that is as an apparatus, process or the like, then it fails to meet 35 USC 101 or 35 USC 112. But here the invention is concretely defined as a machine. Whether or not the invention is patentable is a separate question. In any event, the invention is not merely an abstract idea.

The characterization of the invention as an idea tends to place programmed computers in a class by themselves, which is not Congress's stated intent. The patent laws that have been enacted by Congress require the evenhanded application of all applicable statu-

tory provisions to the claims of the application presented here.

One of the enduring values of the patent system is that it has remained relatively unchanged since 1836. The Act of 1836 granted a patent "to anyone who may have discovered or invented any new and useful art, machine, manufacture or composition of matter." 5 Stat. 117, Sec. 6. This language is nearly identical to our present Section 101, except that today "process" is a more popular synonym than "art".

In *Burr v. Duryee*, 68 U.S. 531 (1863) the patent, to one Wells, was first issued with detailed claims about a hat-making machine illustrated at 68 U.S. 543. The claims are quoted at 68 U.S. 567. The Supreme Court noted that "the original patent of Wells has been more than once decided by the courts to be a valid patent . . . He claims all he had a right to claim as new and no more" (68 U.S. 571). In short, the Wells patent met all of the criteria of the patent laws, including novelty and unobviousness.

The problem in the *Burr* case is that the original patent was reissued as separate patents for the machine and the process in 1856 and was again reissued in 1860, the second time claiming an invention as ". . . forming bats of fur fibres by throwing the fur in properly regulated quantities, substantially as herein described". (68 U.S. 568). The Supreme Court stated that this was an "expansion by an equivocal claim which may be construed a claim for the result or product of the machine, or for its principle or mode of operation". It was an "ingenious attempt by the assignee to expand it into an abstraction". (68 U.S. 568.)

This is the kind of problem that was involved in the old cases referring to "ideas" and "abstractions". Today we would say the claims are either non-statutory under Section 101 or indefinite under Section 112. Even though a specific machine is disclosed, the claims in *Burr* were by the time of the second reissue so indefinite as to constitute abstractions. But *Burr* also pointed out that a machine is not an idea as in a machine.

In contrast, the claims of the Johnston application describe the machine in almost infinite detail. It is inconceivable that claim 20 (Appendix, page 107) could be deemed a mere abstract idea. This claim shows that Respondent is not seeking a patent ". . . for a 'principle' or a 'mode of operation', or an *idea*, or any other abstraction", *Burr v. Duryee, supra*, but only a patent on a machine.

All inventions are based upon ideas. So far as 35 USC 101 is concerned, the sole question is whether the claims cover the idea *per se* or whether they are limited to the implementation of the idea.

The proper inquiry on patentability is whether the machine is new and non-obvious, not whether it is abstract or concrete. As the Court noted in *Benson*, "transformation and reduction of an article "to a different state or thing" is the clue to patentability of a process claim that does not include particular machines". It follows that the patent law is not frozen in old technologies, and that patents for machines involving programmed computers are not to be foreclosed.

Computer-related inventions have been patented for years and should not now be treated as *sui generis* in the absence of Congressional action.

Even though an *idea per se* does not constitute statutory subject matter, inventions that are concrete expressions of ideas may be claimed as processes, machines, compositions of matter, or articles of manufacture, as the case may be. 35 USC 101.

So far as computer technology is concerned, inventions are often embodied in the programmed computer itself. The programmed computer may be claimed as a machine or apparatus. Machine claims that are based on a transformed computer are clearly within the ambit of the patent law, even if a program *per se* is not.

In *O'Reilly v. Morse,* 56 U.S. (15 HOW) 62 (1853) this court said:

> "While a scientific truth, or the mathematical expression of it, is not patentable invention, a novel and useful *structure* created with the aid of knowledge of scientific truth may be." (Emphasis added).

A newly programmed general purpose computer which is unobvious, definitely claimed, and meets all other statutory tests, is just such a new and useful structure.

While it is true that in *O'Reilly v. Morse,* claim 8 was held to be invalid because it was too broad, other claims were held to be valid. Claim 5 is particularly important from the standpoint of the present case because there the invention was defined in terms of the meaning of a code.

Robinson, in his *Treatise on the Law of Patents,* (1890) Vol. 1, page 259, defined "machine" as:

> ". . . an instrument composed of one or more mechanical powers and capable when set in motion of producing by its own operation certain predetermined physical effects."

It follows that since a programmed computer operates in a new way, it constitutes a new machine.

The Patent Office has long recognized that the relations between parts of a patentable claim may be expressed by means of mathematical formulas, *Ex parte Avery,* 41 USPQ 238 (Pat. Off. Board of Appeals, 1939); *Ex parte Massa,* 48 USPQ 331, 333 (Pat. Off. Board of Appeals, 1940). So also has this Court. (*Mackay Radio & Telegraph Company, Inc. v. Radio Corporation of America, supra*).

As early as 1942, the Patent Office issued a patent on an IBM card *per se* in which two additional rows of holes and non-holes were added. The Board held that the new arrangement of holes and non-holes constituted statutory subject matter, *Ex parte Lang,* 56 USPQ 423 (Pat. Off. Board of Appeals, 1942). These claims include limitations regarding how the holes in these two rows were related to holes elsewhere on the card in order to provide an interpretation of the latter holes. In effect, the relationship involved an unpatentable algorithm for ascertaining the meaning of the holes and the patent issued for the article (card), not for the algorithm *per se.*

In the last century, there was debate about the kinds of "process" that were contemplated in the Constitution by the term "useful art". *Corning v. Burton,* 56 U.S. (15 HOW) 252 (1853) concluded that processes ". . . where the result or effect is produced by chemical action, by the operation or application of some element or power of nature, or of one substance to another" are within the scope of the patent laws, notwithstanding the failure of the Patent Act of 1836 to make a process, *eo nomine,* the subject matter of a patent. This

definition of process was expanded to include ". . . an act, or a series of acts, performed upon the subject matter to be transformed or reduced to a different state or thing." in *Cochran v. Deener*, 94 U.S. 780 (1876). By 1880, this court could state without hesitation: "That a patent can be granted for a process, there can be no doubt." *Tilghman v. Proctor*, 102 U.S. 707 (1880).

One would have thought the matter settled nearly a century ago, but Petitioner and the CBEMA seek to set aside the field of computers and computer programs as *sui generis* and not subject to the normal rules of the patent laws enacted by Congress. Whether it is claimed as a process, as in *Benson*, or as apparatus, as here, the invention should be measured for its intrinsic worth under the statutory guidelines as interpreted by this court, notably in *Graham v. John Deere*, 383 U.S. 1 (1966).

The Petitioner and Computer and Business Equipment Manufacturers Association both rely heavily upon the analogy of computer programs on a piano roll. We believe that this analogy is inapposite.

In its application to the facts of this case, *White-Smith v. Apollo, supra* is no different than *O'Reilly v. Morse, supra, Burr v. Duryee, supra*, or any of the other cases dealing with the dichotomy of abstract idea versus concrete expression. *White-Smith* held that a piano roll is not a copy of a copyrighted sheet of music in the sense of the copyright statute. This Court said that a statutory copyright does not extend to every means of expression of the order of notes in a melody. 209 U.S. at 11. A copy of a musical composition must be ". . . a written or printed record of it in intelligible

notation" (209 U.S. at 17). The argument was rejected that copyright is intended to protect the melody itself and all means of expression of the order of notes which the composer has invented (209 U.S. at 11). Stated another way, the form of expression as sheet music is protected by copyright, but another form of expression of the abstract idea (piano roll) is outside the scope of the copyright, even though the abstract idea in the melody is the same.

This philosophy is well grounded in copyright law, and has been recently expressed in *Goldstein v. California*, 412 U.S. 546 (1973). There a different means of expression of the same abstract idea (tape) was held to be outside the scope of the copyright statute so that the states were free to regulate trade in that form of expression, even though the abstract idea recorded on the tape was the same. Tape reproduction was held to be potentially a "writing", but Congress had not yet acted when the facts of the case arose.

But this case differs from *White-Smith* and *Goldstein* because Congress has already stated the criteria for patentability in Title 35. This case is not a question of new technology having outpaced the scope of the patent laws, as the *Goldstein* case involved technology that outpaced the copyright law. Here it is simply a question of whether the machine claimed is within the statutory classes defined in 35 USC 101 and meets the tests of 35 USC 102, 103 and 112.

In *White-Smith* this Court pointed out that a piano roll is a mechanical device. From this it follows that a punched tape or the like may form the basis of a patentable combination.

The admonition of *White-Smith* that "The statute has not provided for the protection of the intellectual

conception apart from the thing produced, however meritorious such conception may be . . ." (209 U.S. at 17) does not apply in this case because the claims relate to "the thing produced", not merely the conception.

The machine of the present application is still a machine, even though it is computer related. It is not a mere idea simply because a computer may be involved.

VI.

Programming a Computer Changes It to a New Machine.

When a program is fed to a programmable computer, the states of various elements in the computer are transformed. If the program is new, then the pattern of states of the various elements is new. The computer with its elements transformed to those new states is a new computer with its parts interrelated in a way that never existed before. Of course, it is another question whether the new computer is worthy of a patent. Nevertheless, it is a new machine.

The states of the various parts of a computer that has been programmed are far less elusive than the states of the elements or groups of elements in a new chemical compound. That pattern determines the functions of the computer.

Programming of machines has been accomplished with the aid of numerous programming devices, such as levers, dials, cams, punched tapes, and punch cards since long prior to the year 1800.

Though algorithmic computers have been manufactured in increasing numbers since the Sixteenth Century, one was made at least as early as about 1000 A.D., and replaceable punched-card programs have been widely understood since at least as early as 1834 (See Appendix A attached hereto).

Programs have long been stored in metal parts by cutting them to desired shapes, in tapes or cards by punching them with coded patterns of holes, and in the memory elements of a general purpose digital computer by changing their states. Just because technology has now grown up to the point where levers and cams have given way to punched cards and memory elements as parts of machines, is no reason to change the patent laws and to penalize inventors who make use of modern technology instead of just the old technology.

A programmable computer is not wholly dissimilar to other kinds of inventions. For example, certain reagents, such as catalysts, may be known and old in themselves, yet in combination with other material produce surprising "non-obvious" results. A catalyst is, by definition, the same at the end of a chemical process as it was at the start. Yet it is capable of greatly simplifying the burden of arriving at the production of a desired product. Economic and technical advantages are part of the measuring stick to determine whether a patent should be granted. A catalyst may be used in a new reaction, even if the catalyst is old, and still the reaction will be (possibily) worthy of patent protection.

The effect of the new structure created by programming the computer is far different from merely feeding a new series of numbers to an old calculator, such as an abacus or Pascal's adding machine, to process the new numbers fed into it in the same old way.

The language of 35 USC 101 fits a programmed computer perfectly, if it is new and useful. The statute says that a person is not only entitled to a patent on a machine, but also to an improvement of it thereto. A programmed computer accomplishes more than an unpro-

grammed computer and is therefore certainly "an improvement of an unprogrammed computer", and hence is at least an improved machine.

Though algorithms per se do not constitute statutory subject matter under 35 USC 101, all processes and machines that are implemented with the aid of algorithms, should be recognized as constituting statutory subject matter.

When a program acts upon a programmable computer to change it to a new machine which performs new functions, this constitutes statutory subject matter under 35 USC 101 and is patentable if the invention meets the requirements of 35 USC 102 and 103, and the claims conform to 35 USC 112.

In his reply brief on the Petition for Writ of Certiorari, the Petitioner has admitted at page 2, the *possibility* of *patentability*

1. If a program coacts with an ordinary computer in a synergistic way, OR
2. If the program is carried out with newly invented apparatus, OR
3. If a program produces a new use for an old machine sufficiently inventive to be patentable as a process.

Possibility of patentability necessarily implies that the subject matters in all three categories are statutory under 35 USC 101, even if they are not patentable under 35 USC 102 and 103.

Johnston's claims define a new machine in accordance with the provisions of 35 USC 112, unlike those of *Benson*. These claims define subject that matter falls both in categories 1 and 2 above, which the Petitioner

admits constitutes potentially patentable subject matter and hence even if not patentable, constitute statutory subject matter.

It makes no difference whether the machine that is programmed is a loom, a radio receiver, a printing press, an automobile factory, a power plant, a set of traffic lights at an intersection of two boulevards, or a computer. And it makes no difference whether the programming is done with gears, cams, or punched cards, or whether electrical or magnetic or some other natural force is used. Congress has not excluded any of those kinds of devices or programming systems from the field of statutory subject matter.

Congress has declined to contract the patent laws to exclude programmed computers from statutory subject matter in the face of the recommendations of the President's Commission (Report of the President's Commission on the Patent System, November 17, 1966).

The Commission had recommended that

> "The classes of patentable subject matter *shall continue as at present, except:*
>
> . . .
>
> "3. A series of instructions which control or condition the operation of a data processing machine, generally referred to as a 'program', shall not be considered patentable regardless of whether the program is claimed as: (1) an article, (b) a process described in terms of the operations performed by a machine pursuant to a program, or (c) one or more machine configurations established by a program." (Emphasis added).

This recommendation, if enacted, was intended by its sponsors, to *change* the law so as to *exclude* from the field of statutory subject matter, inventions of the kind defined by the Johnston claims. Congress has persistently ignored that recommendation. Though Congress has considered many patent "reform" bills since that time, *none* of them has even included any provision for excluding computer programs from the field of statutory subject matter.

The Constitution places no restriction on what inventions are patentable. Congress has defined the classes of inventions that may be patentable in very broad terms and has not excluded programming of computers and programmed computers as patentable subject matter, and said inventions are patentable so long as the claims meet the requirements of 35 USC 102, 103, and 112.

The Petitioner should not be permitted to change the law indirectly by repeated petitions to this Court in a way that the President's Commission has failed to bring about directly by its appeal to Congress. Legislation to give special treatment to any segment of industry, such as manufacturers of general purpose digital computers and to deprive other segments, such as manufacturers of software, of patent rewards for their creations, should not be judicially mandated. If there is to be such special interest legislation, it should be left to Congress.

VII.

Conclusion.

For the above reasons, Amicus urges this Court to clarify *Gottschalk v. Benson* and particularly to hold that a newly programmed general purpose digital computer may be a new machine that constitutes statutory subject matter under 35 USC 101.

Respectfully submitted,

REED C. LAWLOR,
Attorney for Amicus Curiae.

Of Counsel:
THEODORE H. LASSAGNE,
DAVID E. LOVEJOY,
SAMUEL STONE,
JOHN P. SUTTON.

APPENDIX A.

History of Algorithms, Digital Computers, and Programs.

This short history has been gleaned primarily from the works cited in the attached bibliography.

Our discussion is limited to digital computers, that is, to computers in which numbers are changed by discrete amounts, such as 1, or 2, or 3, etc. or multiples thereof. Almost all mechanical digital computers, e.g., adding machines, operate on the decimal digital system. Almost all electronic digital computers operate on the basis of the binary system. Both kinds commonly carry out calculations or other operations automatically in accordance with algorithms[1] that have been programmed into them. The programming may be incorporated in arrangements of gears, cams, punched tapes, punched cards, magnetic tapes, plugs and sockets, or wiring and solder joints. The day will come when the programming will be performed directly by action of the human voice on the computer.

Algorithms for performing operations of addition, subtraction, multiplication, and division have their origin in prehistoric times. It was in the Tigris-Euphrates valley, before about 3000 B.C., that a simple device was developed to facilitate carrying out algorithms manually. It was called the abacus. This device is still in common use in the Orient and in Eastern Europe. The abacus has long employed extra beads to enable the user to apply the 5-carry algorithm and the 10-carry

---

[1]The term algorithm usually refers to a series of mathematical steps for solving a problem of a particular type. It also sometimes refers to a series of steps employed to carry out other processes. More modernly though, the term algorithm has also come to mean a computer program. The term algorithm is used in this appendix only in the first sense.

algorithm. Algorithms for solving complex problems in arithmetic were employed in Babylon in ancient times, but so far as we know, without any machinery (Knuth).

The idea for mechanizing the algorithms of the abacus occurred to the Moors before the year 1000. Early attempts at mechanization of computation were made by Gerbert of Autillac (later Pope Sylvester II from 999 to 1003), and Magnus. (Rosenberg, pages 20-21) Even Leonardo da Vinci had a hand in the subject in the 15th Century. (Rosenberg, page 21) And then:

> "The 16th Century . . . marks the decline of the abacus in Europe in favor of algorithmic methods of calculation." (Hawkes, page 9.)

Many calculators soon appeared for carrying out the algorithms of adding, subtracting, multiplying, and dividing mechanically (Schickard, 1632; Pascal, 1645; Morland, 1666; Leibnitz, 1694, and others). The first calculator that was programmed to enable its user to crank out a series of answers was that of Poleni (1709). Halacy calls Poleni's efforts the first attempt at programming a computer [Halacy, page 44].

Punched tapes and punched cards have been used to program the operations of a loom since before 1730 [Halacy, page 88 and Rosenberg, page 107.] Jacquard automated such looms in about 1804.

In the 19th Century, Charles Babbage, a banker's son and mathematician, designed two "general purpose" digital computers. They were general in different degrees. One was called the "difference engine", the other was called the "analytical engine". Several different persons constructed Difference Engines and put them into practical use (Babbage, Scheutz, Grant,

Deacon). Figure 1 illustrates some of the features of the Difference Engine and one of its "printouts" [from Eames, page 29].

With respect to Babbage's Difference Engine, Lardner wrote, in 1834, in patent-judicial language, after discussing prior work of others:

> "Even had the mechanism of these [earlier] machines performed all which their inventors [Pascal et al.] expected from them, they would have been still all together inapplicable for the purpose to which it is proposed that the calculating machinery of Mr. Babbage shall be applied. They were all constructed with a view to perform *particular arithmetical operations*, and in all of them the accuracy of the result depended more or less upon manipulation. The principle of the calculating machinery of Mr. Babbage is *perfectly general*[2] in its nature, not depending on any particular arithmetical operation, and is equally applicable to numerical tables of every kind." (Emphasis and bracketed portions added.) [Morrison, page 219.]

In 1833 Babbage conceived and commenced the design of his Analytical Engine. His plan for the Analytical Engine is shown in Figure 2 with a few legends added. The drawing is dated August 6, 1840 [Morrison, pp. 378-379].

The Analytical Engine was to be employed for solving almost any kind of algebraic equation and was even designed to solve simultaneous equations, depending upon how it was programmed. Each program was to be

---

[2]Babbage's "Analytical Engine", conceived later, was even more general. What is general today may be considered special tomorrow.

embodied in a pair of decks of punched cards (see upper part of Figure 2) and was to operate on a set of numbers represented by a set of cards that we now call a data deck (see lower right of Figure 2). (Punched cards devised by Babbage are shown by Eames at page 12, and Hawkes at page 23.)

A program for solving a particular algebraic problem $x = (ab + c)d$ is represented in Figure 3.[3] This program was published by Babbage's son in 1888 [Morrison, p. 334]. As used in Figure 3 the term "column" refers to a stack of rotating gears and number wheels in which data is stored. The term column does not refer to a column on a piece of paper. In Figure 3, the first two sections identify the cards in the deck that were to form part of the machine for solving the problem. The third section describes the functions or operations performed by coaction of the cards with the rest of the machine. This same program could be used to solve the equations $E = MC^2$ and $A = \pi R^2$.

Each algorithm was to be embodied in a different pair of program decks. And each pair of decks could be removed and replaced by another. A library of program decks could be built up. Similarly for the data decks.

Babbage's Analytical Engine included three principal parts, a store (memory unit) and a mill (an arithmetic-algorithm performing unit) and a control unit, including the program cards and other components for controlling the interaction of the store, the mill, and peripheral devices, such as a printing press.

[3]The term "program" is often employed to refer to the list of instructions, such as those set forth in Fig. 3. Sometimes the term refers to a deck of punched cards or a punched tape or the like, or other device which coacts with the computer to cause the computer to carry out a series of steps to perform a predetermined calculation that may be desired or, more modernly, to send signals to various kinds of equipment, such as a printing press or a drill press, or a space vehicle, to cause them to act in some required manner.

The "mill" of a general purpose digital computer includes standard components arranged to perform certain simple functions, such as adding, subtracting, multiplying, and dividing.

The "store" receives, or holds, data signals. Today it also usually holds the program.

The nature and function of the control unit is determined by the program that has been stored in it. It controls the feeding of raw data (analogous to grains of wheat, etc.) to the mill, the exact nature and sequencing of the processing that occurs in the mill, and the allocation of the output of the mill to various parts of the output store or elsewhere.

The Analytical Engine designed by Charles Babbage became a reality in the period 1937 to 1944 under the leadership of Howard H. Aiken at Harvard University with the support of IBM and the Office of Naval Research. MARK I, also known as the IBM Automatic Sequence Controlled Calculator, embodied the principles of the general purpose digital computer described by Charles Babbage but employed electromagnetic relays and other electrical circuitry in place of many of the mechanical elements.

Figure 4 shows part of the MARK I including one of the punched tapes in which a program was stored (Aiken, Plate VI opposite page 14). Though this 2000 pound computer was the only one of its kind, it was so well known that it was necessary to publish a 561-page volume to describe its operations and the method of programming [Aiken, Preface].

As indicated in Figures 2 and 4, punched cards and punched tapes are devices in which programs are stored. In more modern computers, the programs are stored in memory units which include memory elements that have states that have been transformed by programming.

More modernly the programs are frequently first stored on a punched tape or a deck of punched cards or on a magnetic tape and then through a translation process that normally includes "compilation" and "assembly," the program is translated into a pattern of states which is stored in the memory elements of a memory unit that forms part of the computer. But just as a deck of punched cards or punched tape forms part of a computer, so also now the programmed memory unit with its changed states forms part of the computer.

Though Babbage's calculator has been likened to a flour mill (see Fig. 5 from Murphy, Vol. 1, page 77), it is really far more because it has many millstones and other devices which are controlled by a program deck to perform operations on input in new sequences to produce new kinds of results.

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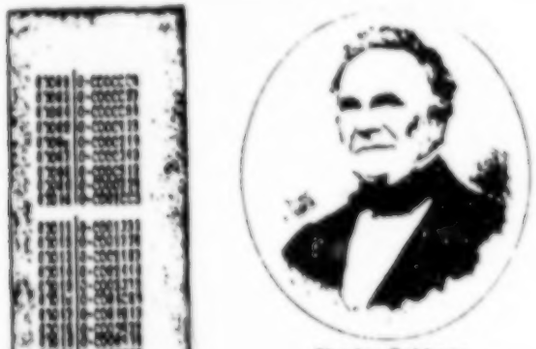
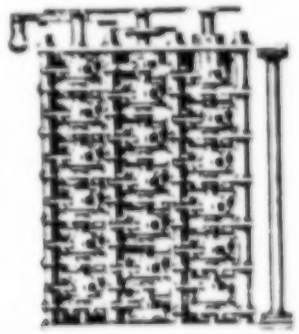
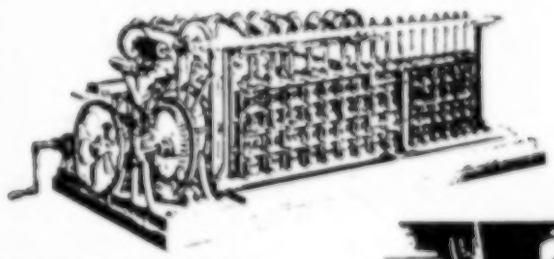


Charles Babbage



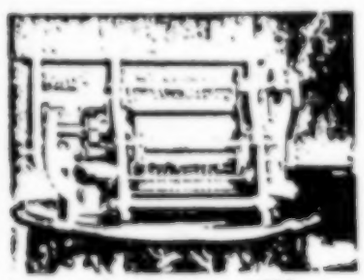
Babbage's difference engine



Difference engine built by
George and Edward Scheutz, 1853

George Scheutz

Type mold made by
the Scheutz engine



Wiberg difference engine, 1859

Difference Engines

These machines, which accumulated differences to produce tables for navigation, insurance, and astronomy, began with Charles Babbage's design in 1823. Other machines based on his concept followed. Perhaps five had been built by the turn of the century.

FIGURE 1.

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III

GENERAL PLAN OF ENGINE No. 1

Plan 25, dated August 6, 1840

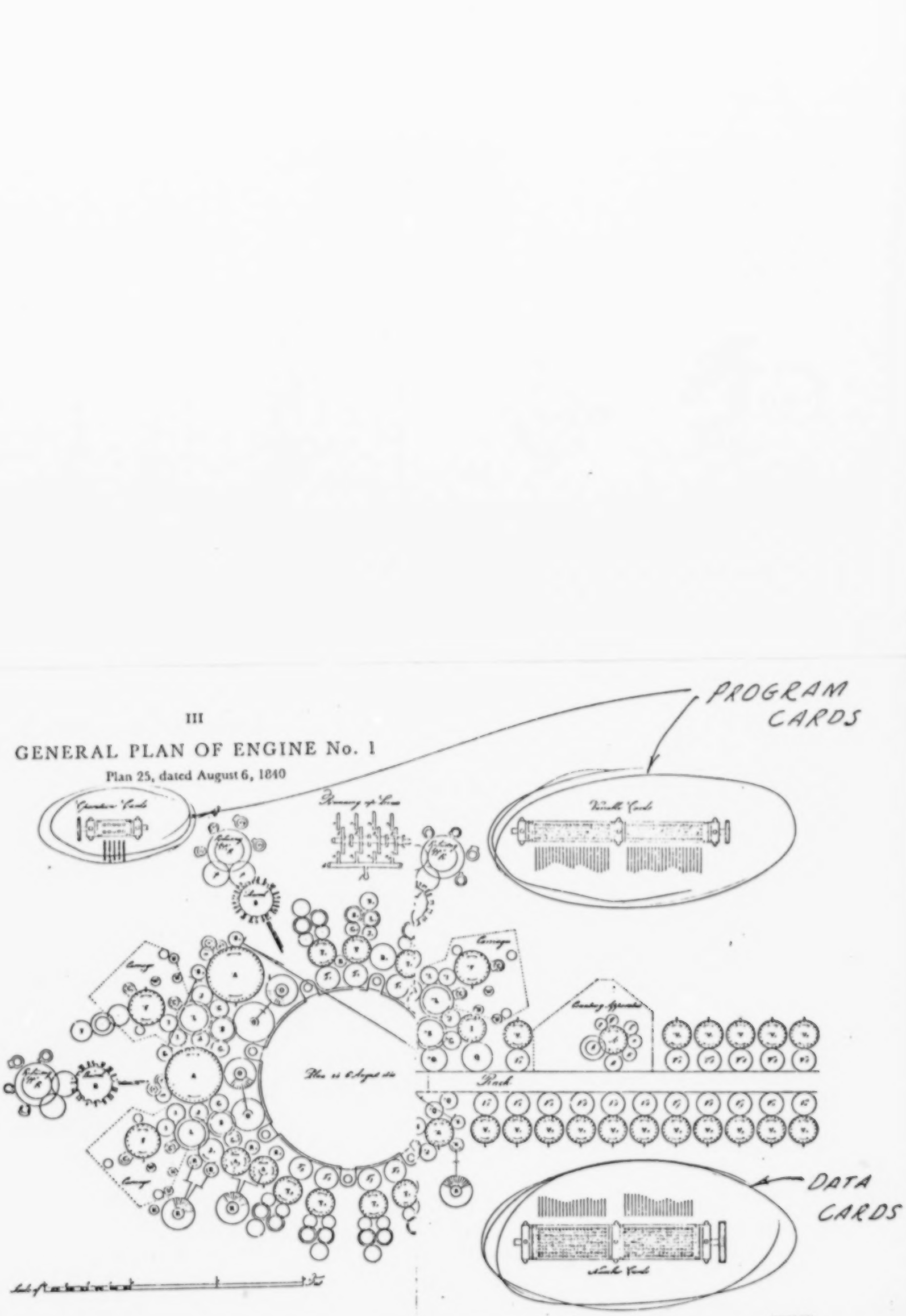

FIGURE 2.

Directive Card	Operation Card	—
1st	...	Places a on column 1 of Store
2nd	...	,, b ,, 2 ,,
3rd	...	,, c ,, 3 ,,
4th	...	,, d ,, 4 ,,
5th	...	Brings a from Store to Mill
6th	...	,, b ,, ,,
...	1	Multiplies a and $b = p$
7th	...	Takes p to column 5 of Store where it is kept for use and record
8th	...	Brings p into Mill
9th	...	Brings c into Mill
...	2	Adds p and $c = q$
10th	...	Takes q to column 6 of Store
11th	...	Brings d into Mill
12th	...	,, q ,,
...	3	Multiplies $d \times q = p_2$
13th	...	Takes p_2 to column 7 of Store
14th	...	Takes p_2 to printing or stereo-moulding apparatus

FIGURE 3.

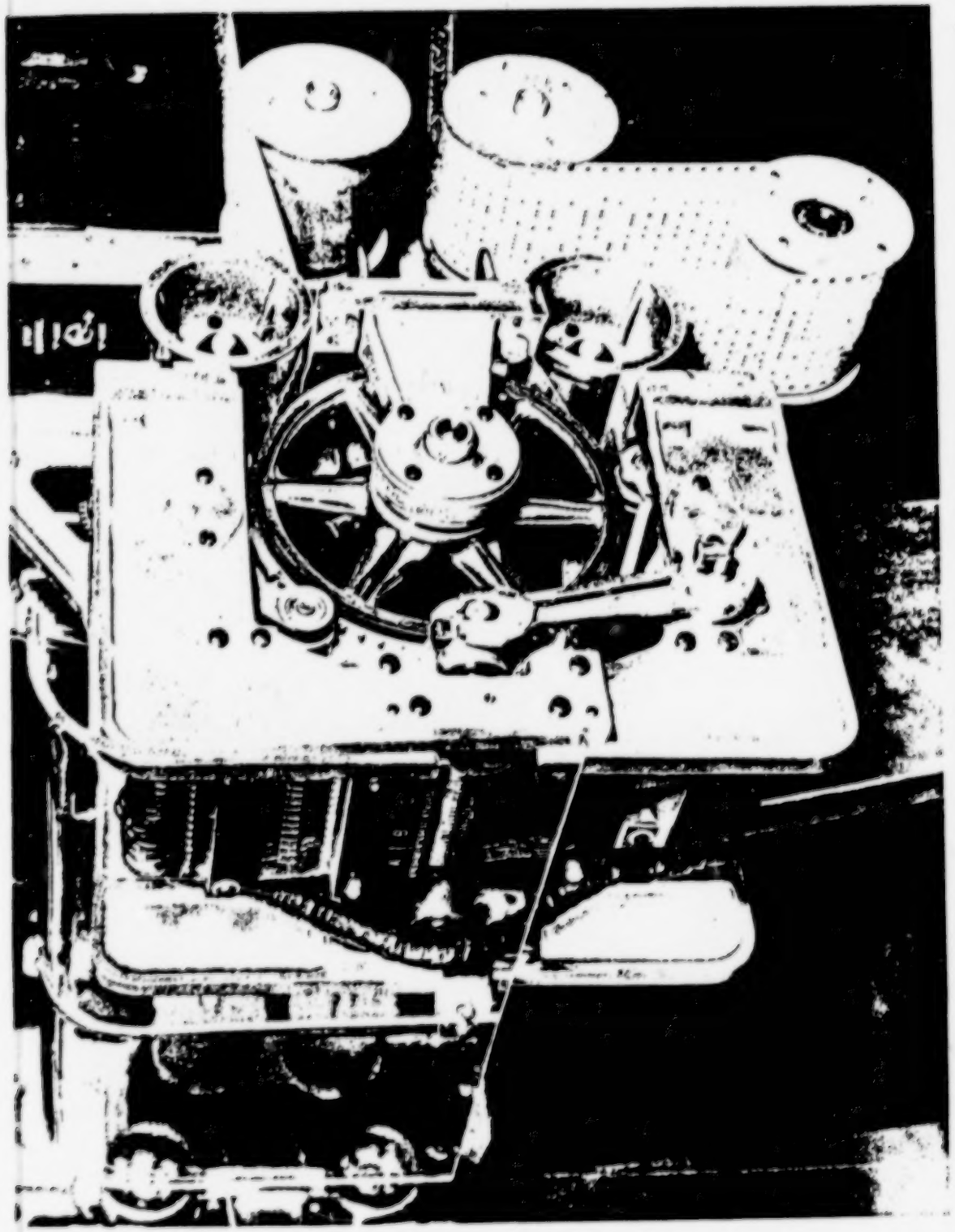

FIGURE 4.

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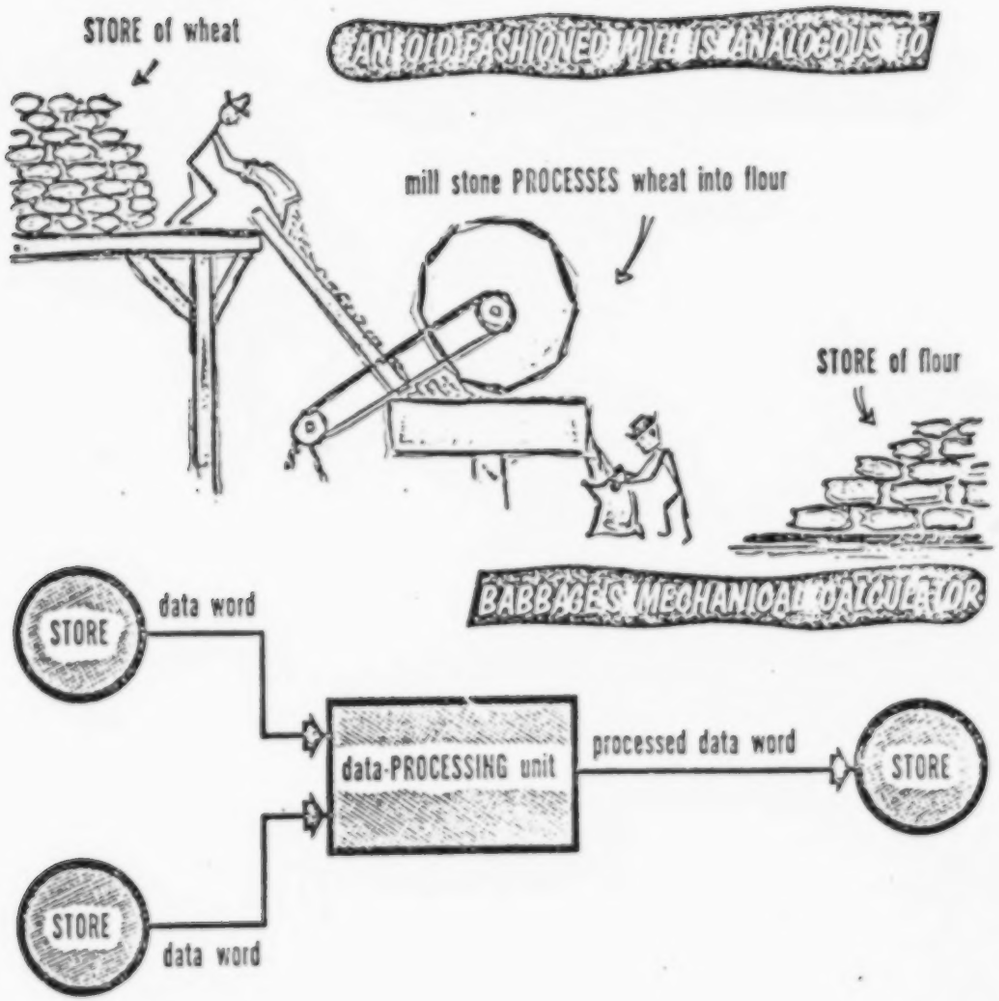
STORE of wheat
AN OLD FASHIONED MILL IS ANALOGOUS TO
mill stone PROCESSES wheat into flour
STORE of flour
BABBAGE'S MECHANICAL CALCULATOR
STORE
data word
data-PROCESSING unit
processed data word
STORE
STORE
data word

FIGURE 5.

IN THE

Supreme Court of the United States

October Term, 1975
No. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS & TRADEMARKS,

Petitioner,

vs.

THOMAS R. JOHNSTON,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

Brief Amicus Curiae for Software Associates, Inc.

REED C. LAWLOR,
412 West Sixth Street,
Los Angeles, Calif. 90014,
Attorney for Amicus Curiae.

Of Counsel:
LEONARD TACHNER,
412 West Sixth Street,
Los Angeles, Calif. 90014.

Parker & Son, Inc., Law Printers, Los Angeles. Phone 724-6622

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IN THE

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On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

Brief Amicus Curiae for Software Associates, Inc.

I.
The Question.

Whether an invention is unpatentable under 35 USC 101 merely because it has been implemented by programming a modern general purpose digital computer.

II.
Consent.

Software Associates, Inc. has received consent from both parties to file this brief *amicus curiae*. The letters of consent have been filed with the Clerk of the Court.

III.

Interest of Software Associates, Inc.

This Amicus, Software Associates, Inc., is a small corporation located in Altadena, California and engaged in the manufacture of software for a wide variety of customers. Amicus believes that it is typical of thousands of other small companies engaged in software manufacture.

Amicus has no interest in Johnston's patent application and does not consider itself prepared to form a judgment as to whether or not the invention described and claimed there is unobvious over the prior art.

However, Amicus believes that it is qualified to discuss the general proposition as to whether a programmed computer is a different machine from an unprogrammed computer and strongly opposes the Petitioner's position with respect to the first two questions set forth by Petitioner at page 2 of his brief.

Because of the uncertain status of the patent law, at least as it appears to the software industry, Amicus has not sought to protect any of its products under the patent laws. Discouraged, Amicus, like many other similar companies, has sought to rely upon the law of trade secrets and the law of contracts in order to protect whatever proprietary rights that it has.

Amicus is familiar with the benefits that small companies derive from the United States patent laws in other fields. By obtaining patents on their inventions, small companies in other industries are given an opportunity to grow, and sometimes do succeed in growing. Amicus believes that companies engaged in software development deserve to benefit from the patent laws to

the same extent as companies in other industries when they make meritorious inventions.

Amicus is familiar with *Gottschalk v. Benson*, 409 U.S. 63 (1972) and is also familiar with many of the practices of the United States Patent Office. Amicus is confused by *Gottschalk v. Benson, supra*, and is dismayed by the prospective costs and difficulties of obtaining a patent on an invention that is implemented by software programming and especially by the prospects that a patent may not be obtained at all without resort to an expensive appeal proceeding.

Amicus recognizes that implementation of most programs does not involve patentable invention. But Amicus also believes that the implementation of many inventions that are based upon programming, whether it be by software programming or hardware programming, are meritorious and deserving of patent protection.

IV.

Summary of Argument.

Amicus, Software Associates, Inc. urges this Court to recognize that programming of computers either by software methods or by hardware methods, constitutes patentable subject matter under 35 USC 101 and that patents should be granted on the basis of inventions implemented by programming of computers, so long as the requirements of 35 USC 102, 103, and 112 are satisfied.

Software programing of a programmable computer transforms it to a new machine that functions differently from either the program alone or the unprogrammed computer alone. The changes in the machine resulting from programming can be detected in various ways.

One general purpose digital computer can even be software-programmed to function like another general purpose computer. Such programming is called "simulation." This fact demonstrates not only that a software-programmed computer is a different machine from an unprogrammed computer, but also that hardware programming and software programming are equivalents.

Simulation is often employed in the early development of a new general purpose computer before it has been built. The function of a new general purpose digital computer is the same regardless of whether it has been constructed by hard wiring or constructed by simulation. The invention is the same in either case. Under 35 US 103, patentability of an invention does not depend on how it has been made. Hence, a machine is statutory subject matter regardless of whether software programming or hardware programming is used in its construction.

V.
Comparison of Software Programming and Hardware Programming.

The analysis presented here will be aided by some familiarity with the similarities of and the differences between hardware and software programming.

Broadly, in computer technology, the term software program often refers to a series of instructions which are written in numerical form or in alphabetical form. These instructions are then stored in a program, such as a deck of punched cards, and then transferred from the cards to the memory unit of the computer where the program is stored on a temporary, or semi-permanent, basis. On the other hand, when the program is

stored in the memory unit by hardware programming, such as by soldering of wires, the program usually remains stored on a permanent basis.

In modern general purpose digital computers, the memory unit frequently consists of magnetic cores, or rings, through which wires are threaded. To simplify the discussion, we will usually assume that we are dealing with a memory unit in which the various cells consist of magnetic cores which can be magnetized in one direction or in the opposite direction around the core.

A program may also be stored in a paper tape by punching holes in it, or in a magnetic tape by magnetizing successive parts of the tape in different ways to represent holes and non-holes. In any event, the programmed device is fed to a card reader or tape reader. As successive parts of the programmed device are fed into the reader, electric signals are created in accordance with the marks or holes in the cards or tape in order to set the magnetization of the cores in one direction or the other, thus storing the program in the computer. In such a storage process, the changes in magnetization in effect operate to change the interconnections between the various wires in order to permit the flow of current in one direction or to prevent the flow of current in that direction. Various sections of the magnetic memory unit, not necessarily physically contiguous with each other, operate together to bring about certain associated operations. Such sections of the memory unit act as controls to perform different functions.

Software programming and hardware programming are often equivalent and one may be employed in place of the other for many different purposes.

It is to be noted that Johnston's application describes his invention as being embodied in a computer that has been transformed in accordance with his program. But Johnston's claims do not specify a program. They specify only the machine formed by programming in terms of means plus functions, as authorized by 35 USC 112.

VI.

A Programmed Computer Constitutes Statutory Subject Matter.

When a program is stored in a general purpose digital computer, the states of various memory elements in the computer are transformed. If the program is new, the pattern of states is new, thus creating a new machine that performs new functions.

New machines constitute statutory subject matter (35 USC 101) regardless of how they are made (35 USC 103).

While the Petitioner, the Commissioner of Patents and Trademarks, recognizes that a new machine constitutes statutory matter (Pet. Br.* p. 11), he urges that programming a general purpose computer does not create a new machine (Pet. Br. pp. 29-38). Case after case has held that programming of a general purpose digital computer creates a new machine. *Ex parte King and Barton*, 146 USPQ 590, 591 (Patent Office Board of Appeals, 1960), *In re Prater and Wei*, 415 F.2d 1393, 1405 (CCPA, 1969), *In re Bernhart and Fetter*,

*The following abbreviations are employed in this brief: "Pet. Br." refers to brief of the Petitioner; "A" refers to the Appendix; "CBEMA" refers to the Computer and Business Equipment Manufacturers Association; "CBEMA Br." refers to the brief of the CBEMA: "Tr. Oral Hearing" refers to the oral hearing held on October 16, 1972 in *Gottschalk v. Benson, supra*.

417 F.2d 1395, 1400 (CCPA, 1969), *In re Comstock and Gilmer*, 481 F.2d 905, 909 (CCPA, 1973). In spite of this long-standing recognition that a programmed general purpose digital computer constitutes a different machine from the unprogrammed computer, the Petitioner now contends the contrary (Pet. Br. p. 12), but supplies no evidence to support his contention.

Because of Petitioner's contention, it is necessary to discuss the issue as to whether a programmed computer constitutes a new machine, without an opportunity to take evidence on the question. The Petitioner has given no proof that a programmed computer is not a new machine. Amicus will attempt to persuade the Court that it is, by reference to evidence that is available to the Court.

When the memory unit of the computer includes magnetic cores interlinked by wires, feeding a new program into the computer, in effect, causes the wires to be interconnected in a new way. After a new program has been stored in such a computer by setting the magnetization of the cores, the various parts of the computer are then in a new set of conditions. As a consequence, they coact or function in a new way, so as to produce new results. While some parts of the computer continue to operate as they did before, by adding, subtracting, or performing other preset functions, the programming of the computer changes other parts to create new controls, so that new sequences of operations and other actions occur. New signals are created because of the new interactions. The Petitioner overlooks those new interactions (See for example, Pet. Br. pp. 16-17). And it is these new interactions that makes the programmed computer a new combination of parts with new controls, as distinguished from an ag-

gregation that does nothing new. *Graham v. John Deere Co.*, 383 U.S. 1 (1966). *Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1950).

Though a programmed general purpose digital computer looks the same as an unprogrammed general purpose digital computer, after being programmed it is not the same, and it no longer functions merely in the same old way. Its new functions constitute evidence that it is a new machine. There are numerous ways that a person can satisfy himself that a programmed computer has been transformed into a new machine by the program fed into it.

One way is to reflect on what the program can do without the computer and what the computer can do without the program. We will reflect below with reference to the action of Johnston's program in relationship to the IBM 1400 to which Johnston's program has been applied in his description.

1. First, consider a program that is represented by a deck of punched cards. Without a computer it is useless for its purpose. The program deck will not calculate.
2. Now consider the 1400. Unprogrammed, it will produce no useful result at all, no matter how many times you push its START button. Until it has been changed by implementation of Johnston's program in it, it will not produce a result for which the program was designed.
3. Now let's program the computer by feeding Johnston's program deck into it. During the feeding operation, the computer takes the cards from the deck, one at a time, and transforms

the patterns of holes on the cards into a new pattern of states of magnetic cores (or other memory elements) of the memory unit of the computer, to store a magnetic or electrical counter part of the program. The cards are not consumed, but remain intact for later reuse.
It is only after the 1400 has been transformed by storing Johnston's program in its memory unit that it is capable of being operated to achieve Johnston's results.

4. Now let's feed records of customer data into the programmed computer as taught by Johnston, and push the START button. This time Johnston's new results are produced. The records are processed automatically in accordance with the procedures carried out in the action of the new controls created by Johnston's program. After the computer has been programmed as taught by Johnston, it remains altered indefinitely (so long as Johnston's stored program is not removed), so that it can continue to achieve Johnston's results each time new data is fed to it.

The reason that the 1400 produces Johnston's new results when it has been programmed by Johnston, is that the machine has been changed to function in a new way. Thus it is clear that the programmed machine is different from the unprogrammed machine, and is indeed a new machine.

Still another way to test a programmed general purpose computer to ascertain that it is indeed a new machine, is to make tests of standard kinds to determine what the states are of the various parts of the computer after it has been programmed.

The states of the memory elements of the programmed computer can actually be pictured by a process known as a "DUMP".[1] Such a process involves electrically triggering the memory elements to create a stream of signals that represents the states of the memory elements and using that stream of signals to print numbers representative of those states on a strip of paper. These numbers provide the operator of the machine with a "picture" or "snapshot" of the *pattern* of states. A succession of "snapshot" DUMPS can even be made while the computer is operating in a "slow motion" mode.

A skilled programmer can read a succession of such snapshots, to ascertain the new physical interrelations that have been created by the program between various parts of the computer and their reactions to the input signals and to each other to produce output signals.

From the foregoing explanation, it is clear that (1) the action of a new program on a computer is synergistic and that a new machine is created by that synergism, (2) the interdependence between the modified parts of the resultant machine is also synergistic, and the coaction is different from that which existed before, and (3) the results may also be synergistic.

Still another way of recognizing that programming an unprogrammed computer creates a different machine, is set forth in the next section.

The Petitioner and the CBEMA have attempted to belittle the programming of a general purpose digital

[1]*IBM System/360 Operating System, FORTRAN IV (G and H) Programmer's Guide*, Form C28-6817-0, pp. 80-81 (IBM, 1968).

computer by comparing it unfavorably to the playing of a piano roll in a player piano and similar reproducing devices (Pet. Br. pp. 16, 35, CBEMA Br, p. 6). The comparison is incomplete and neglects the differences. We will consider the player piano comparison.

To emphasize the difference between a reproducing player piano that plays a perforated piano roll and a programmable general purpose digital computer, we will consider a general purpose digital computer that is programmed by means of two punched tapes, one that bears holes that represent the program and the other that bears holes that represents data.

A player piano, indeed, produces sounds at its output corresponding to the holes on punched roll, line for line. But that is not what is done by a programmed general purpose digital computer.

The computer is altered semi-permanently by feeding in signals corresponding to the holes in the program tape. Then signals corresponding to data are fed in from another punched tape or otherwise. And then the programmed computer manipulates the data signals in a manner controlled by the programmed computer to produce an output which is far different from any line-by-line reproduction of the input data.

A player piano is designed to reproduce as precisely as possible the music played by a musician.[2] The less deviation there is from the original, in the reproduction by the player piano, the better the player piano is considered. The very nature of the action of the player piano remains the same from roll to roll.

A player piano is merely a reproducing machine with one fixed rule of action. That rule of action is

[2]Roehl, Harry N., "Player Piano Treasury", pp. 46-81 (Vestal Press, 1961).

not changed by reading the punched roll. A programmed computer is a signal processing machine in which the rule of action depends upon how the computer has been programmed, so that data later supplied from a punched tape or the like is processed differently according to the nature of the controls for which the computer has been programmed.

With Johnston's programmed computer, unlike with a player piano, the output is not a reproduction of the input data, but is a new composition generated by the computer to meet the requirements of the customer who supplied the data. If different customers supply the same data, the reports generated will be different when the customer requirements are different.

At page 5 of its brief, the CBEMA seeks to distinguish between application programs and system programs. The CBEMA has not explained the difference satisfactorily. The main difference seems to be that "system programs" are normally developed by computer manufacturers, whereas application programs are generally created by others. The CBEMA seeks one patentability standard for application programs and another for system programs.

All programs that alter a memory unit of a general purpose computer to control it to achieve new results, affect the interaction of the parts. All such programs alter the computer so that it achieves new results. So there is no real dichotomy between system programs and the application programs.

Petitioner says that the patentability of inventions based on system programs is not at issue in this case (Pet. Br. p. 16). But the questions 1 and 2 that he presents to be decided at page 2 of his brief are not

limited to only one kind of program. The Patent Act draws no distinction between such programs. None is deducible from it, and there is no clear semantic difference between all system programs and all application programs. It follows that a computer that has been transformed by a program, constitutes a new machine regardless of whether it involves a "system program" or an "application program". And Johnston's invention relates to a system (Pet. Br. p. 6, and lines 1, 2, 5 and 27 of his claim 20 (A., p. 107)).

That a programmed computer is a different machine from an unprogrammed computer is no legal fiction. And two differently programmed computers are different machines. And as we will see, one general purpose digital computer can be software programmed to function like another even though their hardware is different.

VII.

Software Inventions and Hardware Inventions Are Equally Patentable.

In this section, Amicus desires to call the Court's attention to some well-established principles of computer technology that go under the names of "simulation" and "emulation". These words are terms of art that have special meanings in the field of computer technology, somewhat different from their dictionary meanings. The essence of both "simulation" and "emulation" is that one general purpose digital computer may be so altered by programming that it functions like a different general purpose digital computer. Both "simulation" and "emulation" involve the use of software programming in which programs are stored in memory units by transformation of the states of the various cells in those

memory units. On the other hand, emulation also makes use of some additional physical components.

Under 35 USC 103, patentability is not to be negatived by the manner in which an invention is made. It therefore follows that if a new machine is created by software programming it is just as patentable as if it were made by hardware programming.

Since a new general purpose digital computer that has been hardware programmed constitutes statutory subject matter, Amicus urges that if a new general purpose digital computer has been made by software programming, it is also statutory subject matter. And that therefore, all programmed general purpose digital computers constitute statutory subject matter.

Let us explain more fully.

One old general purpose computer, known as a host computer, can be software programmed to function like a different old general purpose computer, called a target, or simulated, computer. When a target computer has been simulated on a host computer, the simulation is known as a "virtual" computer. The virtual computer can then execute user's programs and data in the same way as the target computer and can then produce the same results as the target computer.[3]

[3]Knuth, Donald, *The Art of Computer Programming*, Vol. 1, page 199 (Addison Wesley, 1968). Chu, Yoahan, *Introduction to Computer Organization*, page 170 (Prentice Hall, 1970). Katzan, Harry, Jr., "Computer Organization and the System/370", *Computer Science Series*, pages 264-265 (Van Nostrand Reinhold Co., 1971). Parmelee, R. P., *et al.*, "Virtual Storage and Virtual Machine Concepts", pp. 99-130, *IBM Systems J*, Vol. II, No. 2 ,1972).

It is not only possible to simulate an existing target computer on a host computer, it is even possible to simulate on a host computer, a newly invented computer that has not yet been actually built by being wired and bolted together, and made ready for use.[4] Professor Knuth has pointed out that it is usually advantageous for a computer manufacturer to simulate a new machine before it has been built, so that software for the new machine may be developed (on the virtual machine) as soon as possible.[5]

It is also possible to simulate several different target computers on the same host general purpose computer at the same time. In this case, users who have programs that were designed to run only on different target machines can run their programs simultaneously on the two virtual machines that they both "see" concurrently embodied in the same host machine.[6]

Since a host general purpose digital computer can be programmed to function like a target general purpose digital computer, it follows that the resultant virtual computer is equivalent to the unprogrammed simulated target computer. Though the virtual computer may be slower in operation than the target computer, the loss of speed is often far outweighed by the saving in the cost of building or buying the target computer.

The equivalence between hardware programming and software programming also becomes readily apparent by

[4]Chu, *supra;* Knuth, *supra*, Katzan, *supra.*

[5]Knuth, p. 199.

[6]Parmelee, *et al., supra.*

considering how an old, host general purpose computer can be restructured to function like a new, target general purpose computer. In order to achieve a restructuring of the old computer to function like the new, three general methods are available, namely:

1. Rewiring the old general purpose digital computer.
2. Programming the old general purpose digital computer to simulate the new general purpose digital computer.
3. Emulating the new general purpose digital computer.

Both simulation and emulation involve software programming; but as previously mentioned, emulation also involves the addition of auxiliary electro-mechanical components.[7]

Of course, to design and develop a new general purpose computer, it is not necessary to construct the new computer in its entirety by programming an old computer. It may be sufficient in many cases merely to simulate some of the important subcombinations of the elements that are to form the new computer.[8]

In any event, when one computer is restructured by rewiring, simulation, or emulation, the modified host computer then functions like the target computer (except possibly for speed of operation). Since the restructured computer functions like the target computer in each case, they are equivalent. It follows therefore, under 35 USC 112, that the target computer is covered by the claims of a properly written patent on the target computer regardless of how the restructuring is accomplished. Infringement would exist regardless of whether

[7]Katzan, *supra;* Parmelee, *et al., supra.*

[8]*Chu, supra.*

the restructuring is accomplished entirely by rewiring or entirely by software programming or partly by each. If this were not so, patents based upon the disclosure of a hardware implementation "would be of little worth". *Continental Paper Bag Co. v. Eastern Paper Bag Co.,* 210 U.S. 405, 418 (1908). *Graver Tank & Mfg. Co., Inc., et al. v. The Linde Air Products Company,* 339 U.S. 605 (1950).

By the same token, an invention that has been made by means of software programming should be patentable on the basis of a disclosure of the software implementation and the patent thereon should cover equivalent hardware.

The fact that one general purpose computer can be constructed by simulation on another computer, can only mean that inventions that have been implemented by software programming are patentable just as are inventions that have been implemented by hardware programming.

Furthermore, if, as the Petitioner sometimes urges in many places (see for example, Pet. Br. pp. 29-38), software programming cannot form the basis of a patentable invention as a machine, then neither can hardware, if that hardware is capable of being simulated by equivalent software. And no one urges that patents may not be based on hardware implementations of programs. It follows therefore that patents may be based on software implementations of programs.

Under 35 USC 112, it is only necessary for an Applicant for patent to describe the best mode contemplated by him at the time for carrying out his invention. It is not necessary to describe any other mode. *Continental Paper Bag v. Eastern Paper Bag Co.,* 210 U.S. 405 at 418-420 (1908). *Tilghman v. Proctor,* 102

U.S. 707 at 726 (1880). *Chicago Pneumatic Tool Co. v. Hughes Tool Co.*, 97 F.2d 945 (CA 10, 1938) cert. den. *In re Gay*, 135 USPQ 311 (CCPA, 1962). *In re Brebner*, 173 USPQ 169 (CCPA, 1972). Accordingly, if an invention is capable of being implemented in both software form and in hardware form, a disclosure of either is sufficient to form a basis for claims that cover both.

Very frequently, software programming of a general purpose digital computer to implement an invention represents the best mode of practicing the invention. This occurs, for example, where it would be too expensive or time-consuming or both, to build a completely new computer by wiring and bolting. It also may represent the best mode where it is desirable to practice the invention at many different locations, but for only short times at each. By software programming, the investment of time and money for achieving the desired results may be greatly reduced and the invention made available more readily and quickly to members of the public. An applicant should be entitled to "means plus functions" claims under 35 USC 112 even if he discloses implementation of his program by software methods. The law requires him to disclose his software methods if that is his best mode. And he should not be punished for complying with the law.

Therefore, inventions that have been implemented by software-programming of computers should be recognized as constituting statutory subject matter and should be held to be patentable so long as the invention satisfies the requirements of 35 USC 102 and 103 and the description and claims satisfy the requirements set forth in 35 USC 112, and the claims do not suffer from the defects of the Benson claims.

VIII.

All the Evidence of Record Supports the Conclusion That Johnston's Programmed Computer Is a New Machine.

The statements of the Petitioner that programming of a general purpose digital computer does not make the computer a new machine, is not supported by evidence. It is merely a categorical, unsupported conclusion.

Johnston's patent application constitutes a document filed under oath or declaration (35 USC 115, 25). Johnston's application, therefore, constitutes evidence. Johnston describes the functions of the computer having his program stored in it. There is no denying that his computer is a machine or that it functions as described. The only question is whether it is a new machine.

Johnston's claims have been rejected as being obvious over the prior art. This rejection constitutes an admission by the Petitioner that Johnston's machine is different from any machine in the prior art. *Graham v. John Deere*, 383 U.S. 1, 17 (1966). Since the rejection is under 35 USC 103 but not under 35 USC 102, Johnston's machine must be a different, and hence new, machine.

There is also no denying that Johnston's programmed computer is useful.

35 USC 101 only requires that a machine be new and useful in order to constitute statutory subject matter.

By the Petitioner's own admission, therefore, it follows that Johnston's claims define statutory subject matter under 35 USC 101.

IX.

Gottschalk v. Benson Favors Granting of Patents on Inventive Programming of Computers.

The majority of the Court below held that the Johnston invention constituted statutory subject matter and that the invention was properly claimed.

In the sole dissenting opinion concerning the issue of statutory subject matter in *In re Johnston* (A., pp. 17ff), the view was expressed by Judge Rich that *Gottschalk v. Benson, supra,* should be clarified. Amicus agrees with the majority opinion that the subject matter of Johnston's claims constitutes statutory subject matter and that the invention was properly claimed. Amicus also agrees with the dissenting opinion of Judge Rich that *Gottschalk v. Benson, supra,* should be clarified.

At some points, Petitioner concedes that programming of a computer may constitute patentable subject matter (Pet. Br. p. 29). But at other points (*e.g.*, Pet. Br. pp. 28, 35) Petitioner is inconsistent and, Amicus believes, in error.

More particularly, at some points of his brief, the Petitioner seems to proceed on the assumptions (1) that *Gottschalk v. Benson, supra,* held that no process claim to an invention that is implemented by programming of a general purpose digital computer is patentable (Pet. Br. pp. 7, 8, 9, 12, 27, and 28); (2) that apparatus claims are equivalent to process claims in every respect (Pet. Br. pp. 7, 10, 31); and (3) that therefore all apparatus claims to inventions that are implemented by software programming of a general purpose digital computer are also non-statutory (Pet. Br. pp. 8, 12, and 29). With these three propositions, Amicus disagrees.

The holding of *Gottschalk v. Benson, supra,* was a narrow one. *In re Cristensen,* 478 F.2d 1392 (CCPA, 1973).[9] The *Benson* holding was made with respect to process claims that had failed to satisfy any of four important criteria. Thus, in *Benson,*

1. The claims were not limited to any particular art or technology, AND
2. The claims were not limited to any particular apparatus or machinery, AND
3. The claims were not limited to any particular end use, AND
4. Furthermore, they were not limited to "transformation and reduction of an article 'to a different state or thing' ".

As a result, Benson's claims were broad enough to cover a mental process for carrying out a mathematical algorithm. That's what the case was all about (Tr. Oral Hearing, p. 30).

It has been known since at least as early as 1944 that the process by which even the most simple algorithms are carried out in a general purpose digital computer differs from mental processes for carrying out those same operations.[10] The Benson, *et al.* claims

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[9]Lawlor, Reed C., "Benson and Beyond", Computer Law Service, Vol. 3-2 Art. 3 (Callaghan & Company, 1975). (A copy is on file with the Clerk.) See also, "Are Computer Programs Ever Patentable? Did The Patent Office Win?", *BNA's Patent, Trademark & Copyright Journal,* No. 124, pp. C-1 to C-6, 4-19-73 (BNA, 1973). A comprehensive bibliography on computer program protection will be found in the 1974 Committee Reports of the Section of Patent, Trademark and Copyright Law of the American Bar Association, pp. 306-320.

[10]Aiken, Howard H., *et al.*, "A Manual of Operation for the Automatic Sequence Controlled Calculator", Harvard Univ. Press, 1946, in *The Annals of the Computation Laboratory of Harvard University,* Vol. 1, pp. 3-4.

were not even limited to carrying out their process in a digital computer.

While Benson's claim 8 mentioned a "reentrant register", Benson, *et al.* had urged during the prosecution of their application in the Patent Office that a claim specifying a "reentrant register" could be carried out with only pencil and paper. Claim 13 specified no element bearing any resemblance to apparatus. Thus the Benson, *et al.*, claims were not limited to any particular machine, as held by the Court. Not being limited otherwise to satisfy any other criteria mentioned above, it is apparent that Benson, *et al.* were seeking a patent that would cover a mental process that could be carried out with only pencil and paper. In *Benson* it was only such broad claims that were held to be unpatentable.

In *Benson*, the Court clearly indicated that patents for programming of computers, on the basis of either process inventions or machine inventions, were not foreclosed, if the inventions were properly claimed. Thus, the Court implied that inventions that are implemented by programming of computers may not only be claimed as apparatus but even as processes if properly limited.

In contrast, with the claims of Benson, *et al.*, Johnston's claims specify "means plus function", making it clear that his claims are for apparatus and hence are not for a process to be carried out without apparatus. Thus it is clear that Johnson does not consider his invention to lie in a mental process or in an algorithm, but in a machine. Consequently, under 35 USC 112, Johnston's claims cover only the machine that he has

disclosed and equivalents thereof. Since the human mind is not a machine or any part thereof, Johnston's apparatus claims do not cover the human mind or its operations. *In re Prater and Wei*, 415 F.2d 1393, 1406 (CCPA, 1969). *In re Bernhart and Fetter*, 417 F.2d 1395, 1401 (CCPA, 1969), *In re Foster, Kerns, and Sengbush*, 438 F.2d 1011, 1015 (CCPA, 1971). Johnston's claims cover only a machine; and though a machine may perform a process, it is really only a "thing" that is visible to the eye (*Tilghman v. Proctor*, 102 U.S. 707, 728 (1880)).

Equating apparatus claims to process claims, as attempted by the Petitioner (Pet. Br. pp. 7, 10, and 31) is improper. While it is true that the skilled draftsman can write claims either in method form or in apparatus form in certain types of cases, this does not make the two types of claims equal. It has long been recognized that process claims and apparatus claims cover different inventions. One reason is that the process may be invented by one person and the apparatus by another (*Robinson, Treatise on the Law of Patents*, Vol. 1, p. 250). Even when the method and apparatus inventions are made by the same person, the rule is the same. Hence, process claims and apparatus claims differ not only in format, but in substance.

Therefore holding that Johnston's apparatus claims cover statutory subject matter is consistent with *Gottschalk v. Benson, supra*, especially since they specify particular apparatus in the manner set forth in 35 USC 112 and are free of other defects present in the claims of Benson, *et al.*

X.

Patents for Inventions Implemented by Means of New Programs Take Nothing Away From, but Provide Something New for, Owners of Old Computers.

The Petitioner seems to argue, at page 35 of his brief, that the grant of a patent to an invention that involves changing an old computer into a new one by means of a program, would take something away from the public which already possesses the old computer. The fact is that the public would still have a right to use the old computer in the same old way that it always had and even new unpatented ways. The public would only be excluded from practicing the invention in the new programmed computer. This is true regardless of whether hardware programming or software programming is used to achieve the change. The fact that software programming results in only temporary change makes the principle more applicable than if permanent or semi-permanent hardware changes were made, since with software programming, the changed computer can be restored to its original state more easily, swiftly, and economically than if hardware changes were made.

In *United States v. Dubilier Condenser Corp.*, 289 U.S. 178 (1933), the Court stated, at page 186:

> "An inventor deprives the public of nothing which it enjoyed before his discovery, but gives something of value to the community by adding to the sum of useful knowledge."

It is sometimes argued that the patentee would take something away from the public if a patent is issued on the basis of an invention which would involve programming a computer in its practice, because the owner of the computer already has a right to use that program-

based invention in his computer (Pet. Br. p. 35 and CBEMA Br. p. 21). It is argued that computers are intended to use programs; therefore, the public should be entitled to use any new program in spite of the fact that the program was not invented by the manufacturer or owner of the computer. A more unjustified assertion of rights of machine builders and owners could not be made.

To appreciate how unjustified the Petitioner's position is, let us consider the reverse fact situation where the program has been developed and fully tested in one computer prior to the invention of another computer.

Suppose that you have discovered a new program and have marketed it for many years. Now suppose that the ABC company later invents a new computer that can use your program more effectively.

Wouldn't it be unfair to argue that you have a right to make and use the new computer without the permission of the ABC company since the ABC company should have no right to restrict your right to use *your* program on *its* new machine? Wouldn't it be unfair to argue that a patent on the new computer should not issue because it allegedly would diminish your right to use your program?

A patent granted to the ABC company on its new computer would take nothing away from you that you already had.

And so it is, granting a patent to the inventor of an implementation of a new program is perfectly proper under the patent law, since he takes nothing away from but adds to the sum of the public's useful knowledge. *Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147 (1950).

XI.

The CBEMA Relies on Statements of Foreign Origin That, in Fact, Do Not Support Its Position Against Patentability, but Instead Support Amicus' Position for Patentability.

Time and space do not permit review and discussion of all the incomplete and unsupported statements in the CBEMA brief allegedly based on foreign views regarding inventions of the kind under discussion here. Such statements are really immaterial and irrelevant to the present case.

Nevertheless, since the CBEMA has raised such questions, Amicus desires to point to a few examples that demonstrate that patentability of software programming inventions is favored under foreign views.

At page 25 of its brief, the CBEMA refers to another possible form of protection that has been suggested for preserving some proprietary rights in computer programs (See also Pet. Br. p. 36). These statements might lead one to believe that the Advisory Group of the World Intellectual Property Association has recommended that a new form of protection be developed as a substitute for patent protection. The opposite is the case. Such a proposal (known as the IBM registration proposal),[11] while it may be useful in a limited way, cannot substitute for patent protection of meritorious inventions.

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[11]"Software Protection, the Legal Protection of Computer Programs", two day conference at the Bedford Hotel, Brighton, Thursday and Friday, 13th and 14th November, 1969. Report of Proceedings, p. 48 (British Computer Society, May 22, 1970). (A copy of those proceedings has been filed with the Clerk of the Court.)

The Advisory Group of the World Intellectual Property Association cited by the CBEMA, has recognized the importance of preserving the rights to obtain patents on program-related inventions, as follows:

> "Patent protection should not be withheld from inventions for the reason that they involve computer programs when such inventions fulfill the traditional requirements of patentability".[12]

This view was reiterated in the final report of the Advisory Committee dated July 14, 1975, where it said,

> "In the discussion on existing forms of legal protection, it was stressed once again that inventions fulfilling the requirements of patentability should not be excluded from protection merely because they related to a computer program or involved a software element. It was noted that patent protection could not apply to computer programs which do not meet the standard of inventiveness. . . ."[13]

and added,

> "as regards legal protection of computer programs, a special type of protection should be established, without prejudice to the continuation of any existing forms of protection, in particular copyright, patent or unfair competition laws: . . .".[14]

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[12]1975 WIPO (World Intellectual Property Organization) Meetings, Report AGCP/NGO/II/4, dated March 14, 1975, Annex II, page 8, March 12, 1975.

[13]1975 WIPO Meeting, Report AGCP/NGO/II/11, dated July 14, 1975, Annex II, page 3, July 14, 1975.

[14]1975 WIPO Meeting, Report AGCP/NGO/II/11, *supra*, page 5.

The brief of the CBEMA also cites instances of actions in foreign countries that purportedly would be unfavorable to Johnston's position if they were U.S. cases. In Germany, with respect to which CBEMA has cited two vaguely identified and probably inapposite cases, in a third case, not cited by the CBEMA, the Senate of the German Federal Patent Court, which is the highest patent court in Germany, held that claims in the German Benson case that were narrower than those in the U.S. Benson case, were patentable under German law, and ordered the patent published.[15]

The CBEMA brief also refers to the effect that U.S. patents might have on trade.

The recognition that inventions implemented by programming of computers constitute patentable matter, would actually increase competition and public disclosure of important programs. It would compel hardware manufacturers to disclose their important programs in patents instead of keeping them secret. At the same time, recognition that such inventions are patentable, would facilitate growth of small software manufacturers, all of which appears to be opposed by many hardware manufacturers.[16]

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[15]In the appeal, Western Electric Company Incorporated, Case No. 778, the German Federal Patent Court, May 28, 1973. An English translation of the opinion appears at 4 *Computer Law Service Reports*, p. 474 (Callaghan, 1974).

[16]These views were explained by Dr. G. Aspden, Director of European Patent Operations IBM, UK Laboratories, Ltd., in a panel discussion of a conference held by the British Computer Society in 1969. See "Software Protection, the Legal Protection of Computer Programs", *supra* at pp. 47-48.

XII.

Conclusion.

For the above reasons, Amicus urges this Court to clarify *Gottschalk v. Benson*, and particularly to hold that an invention that is implemented by programming a general purpose digital computer constitutes statutory subject matter under 35 USC 101.

Respectfully submitted,

REED C. LAWLOR,
Attorney for Amicus Curiae.

Of Counsel:
LEONARD TACHNER.

Supreme Court, U. S.
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IN THE

SUPREME COURT OF THE UNITED STATES

October Term, 1975 No. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS AND TRADEMARKS, *Petitioner*

v.

THOMAS R. JOHNSON

BRIEF AMICUS CURIAE FOR APPLIED DATA RESEARCH, INC. (ADR)

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

CAROL A. COHEN
Attorney for Amicus Curiae
Applied Data Research, Inc.

THE LEGAL INTELLIGENCER, 66 NORTH JUNIPER STREET, PHILA., PA. 19107 (215) 561-4050

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No. 74-1033

IN THE

SUPREME COURT OF THE UNITED STATES

October Term, 1975

C. Marshall Dann, Commissioner of Patents and Trademarks, *Petitioner*

v.

Thomas R. Johnston

On Writ of Certiorari to the United States Court of Customs and Patent Appeals

BRIEF AMICUS CURIAE FOR APPLIED DATA RESEARCH, INC. (ADR)

Applied Data Research, Inc. (hereinafter ADR) files this brief *amicus curiae* in opposition to Petitioner, together with letters of consent of the parties in accordance with the Rules of the Court.

QUESTION PRESENTED

Whether a machine system implemented in software[1] is patentable equally with the same machine system implemented in hardware.[2]

INTEREST OF AMICUS CURIAE

ADR was incorporated in 1959 and since then has been a small business engaged in the computer field in the marketing of various computer services, proprietary software products and proprietary hardware/software products.[3] ADR presently markets six software products and has been awarded two software patents, one of which was the first patent issued for a software product on the market.[4] This first patent was issued to ADR's AUTOFLOW

1. Software, the stored programs used with a general-purpose computer to construct a special-purpose computer.

2. Hardware, the physical equipment or devices forming a general-purpose computer.

For a discussion of relationships of the technologies of hardware and software as they bear on legal issues before the Court, see Jacobs, "Computer Technology (Hardware and Software): Some Legal Implications for Antitrust, Copyrights and Patents", *Rutgers Journal of Computers and Law*. Vol. 1970, No. 8, p. 50 and "Hardware Design Reflecting Software Requirements," Prof. Saul Rosen, 33 Proc. of the Fall Joint Computer Conference, Dec. 1968, Pt. II, pp. 1443, 1444.

3. ADR has no interest in any patent that may issue on the Johnston application.

4. U.S. No. 3,533,086 of Martin A. Goetz, issued October 6, 1970 for "Automatic System for Constructing and Recording Display Charts."

The other ADR patent is U.S. No. 3,380,029 of Martin A. Goetz, issued April 23, 1968 for "Sorting System." The issuance of this patent received considerable publicity as a so-called "first software patent." Actually, this patent was the first one that was *candidly* presented as implemented by software programming. Prior to that, hardware companies had obtained such patents by the stratagem (called Fabian Strategy by the Patent Office Solicitor) of presenting the invention as though implemented by hardware

System, which is one of the most successful standardized software products on the market.

ADR also has a line of software/hardware products called STAR. These products monitor telephone lines and are sold as a total machine to large telephone users. ADR develops the software, builds display equipment, buys standard mini-computers and with engineers, programmers, draftsmen, and technicians builds the STAR systems on a small assembly line. ADR has applied for a patent on one of its STAR products[5] and believes that an adverse decision in the Johnston case may undermine ADR's existing and pending software patents.[6]

ADR is a manufacturer of special-purpose computers created by using ADR software with standard general-purpose computers available from hardware manufacturers such as IBM. Due to the nature of the software technology, a small business like ADR can engage in such a manufacturing business and successfully compete in the open market with the giant hardware manufacturers. For example, IBM also markets software programming, much of it ostensibly "free," though its principal business is nominally (as a reflection of its hardware pricing strategy) the manufacture of computers based on hardware programming.

The following information reflects ADR's experience in developing and marketing its "software" products: The initial cost to develop a software product ranges between

programming, not by software. One example of such a patent is U.S. No. 3,339,182, "Optimum Result Computer" of IBM. The use of this stratagem by the hardware manufacturers and its recognition by the Patent Office and others manifest the common understanding of the engineering equivalence of the software and hardware technologies.

5. Patent Application S.N. 562,910 for "Telephone Circuit Monitoring System," David Waks, *et al.*

6. Software patents are patents on special-purpose machine systems that, because of technological and economic reasons, are constructed by means of stored programs (*i.e.*, software) and a general-purpose computer.

$50,000 and $500,000.[7] The annual cost to service, maintain and enhance each product is about equal to the development costs.[8] It usually takes 1 to 2 years to develop a product to the point where it is marketable. At least 1 year on the market is required before the number of sales for a particular product reaches a satisfactory level in terms of profitability. Software products are expected to remain marketable for at least 5 years, and must be continually improved to stay competitive during that period. Certain software products, however, may be useful for as many as 10 years or more. The obsolescence factor is more dependent upon the life-span of the class of hardware with which a software product operates than on the functioning of the software program itself. In summary, large investments must be made prior to marketing a software product, and continuing investments are required throughout its marketable life-span.[9]

Petitioner and the supporting hardware manufacturers and their association, CBEMA, oppose patents for software implemented inventions on the grounds that software is an "idea," merely a "method of doing business," as though software had a certain ephemeral character, a nonphysical or "non-machine"[10] character. Software is

7. As an average, about $200,000 per product is usually invested.

8. ADR has invested almost $2 million in the development and maintenance of AUTOFLOW.

9. See Goetz, "What's Inside the Software Industry," *Computer Decisions*, July, 1975, p. 18: "The business of developing and marketing software products is at least as complex as the business of selling computer hardware, and so requires considerable financial and human resources. There are several marketing considerations that clearly reflect the true nature of software products. These include the need for continued investment in a product even after its release, an effective marketing and pricing strategy for each product, and substantial technical support."

10. See Jacobs, "Patentable Machines—Systems Embodiable in Hardware or Software (The myth of the Non-Machine)," *Proc. Law of Software*, 1968, p. B-77. Geo. Wash. Univ. Natl. Law Center.

a machine[11] and not ephemeral nor a "method of doing business," nor an "idea."

No one case or group of cases can give the Court a picture of the range of complexity of the software technology and the extraordinary variety of machines that have been built and the far larger variety that remain yet to be built. The complexities and intricacies of the software are comparable to those of the general-purpose computer (the hardware) which is an extremely complex machine.

SUMMARY OF ARGUMENT

The products of competitive hardware and software companies and their opposing economic interests demonstrate that the issues underlying this case are related to the real world of machines and not to "ideas."

The technological facts reveal that "software patents" are patents for automatic data processing machines and computer machine systems—not patents for "methods of doing business," "mental processes," or "mathematical algorithms." An examination of several examples of innovative software demonstrates the machine nature of the product. Software and hardware are engineering equivalents and any particular program, such as ADR's AUTOFLOW, could alternatively be built in hardware. Hardware machines that "talk" or "read" or "diagnose" problems in telephone systems are not business methods or mental processes; clearly the same is true of software-built machines which perform these same tasks.

The proposals of IBM and the other hardware manufacturers for copyright or other forms of protection of software would reverse the constitutional policy of providing an incentive for innovation in these "useful Arts."

11. As recognized by IBM, ". . . in some respects computer programs and hardware are interchangeable; hence one can say that a new computer program is similar to a new machine." Galbi, "Proposal for New Legislation to Protect Computer Programming," 17 *Bull. Copyright Soc'y.*, 280, 281.

ARGUMENT

1. The economics of the computer industry, as well as the opposing economic interests of the competing companies in the computer industry, demonstrate that the real issues involved in this case are machines and machine systems, and not "methods of doing business."

The software side, or sub-industry, of the computer industry is itself a multibillion dollar business whose software directs the operation of stored-program general-purpose hardware. Without software programming, the general-purpose hardware is useless[12], but with software, an "extended machine" is produced. Thus, it is the availability of software that has permitted the computer industry to develop. The argument of the hardware manufacturers (CBEMA) about "methods of doing business" seeks to perpetuate a myth of the "non-machine." These legal arguments stand in strong contrast to their advertised claims for superior machine construction and operation due to the software.[13]

12. To one who sought some criteria for determining the value of such general-purpose hardware without any software, the suggestion was made to call in a junkman, who would ask simply, "What does it weigh?"

13. See Burroughs advertisement in 227 *Scientific American* 2, July 1972, in which Burroughs sells its machines (hardware and software) with the claims of "More powerful and productive computer systems" that offer *inter alia*, "A comprehensive library of program products for major savings in program development time and related costs" and of "A more powerful and productive master control program" that "increases throughput 10 to 20% . . . [and] confirms Burroughs leadership in control program technology." See also the news article, "Burroughs' Wide Ride With Computer," *Business Week*, July 1, 1972, pp. 54-58.

An IBM announcement (in the *Wall Street Journal*, August 3, 1972, pp. 43, 49) of its new machine technology also stresses the machine character of the software in offering its product for sale: "System 370 virtual storage is created by circuitry and advanced programming that link slower but far less costly peripheral disk storage to main storage in the computer." Certainly, it is not an "idea" that, together with circuitry, does the linking of the disk storage to the main storage.

ADR's experience in the computer industry shows the need for software patent protection. Although it is almost impossible for a small software company to compete successfully against IBM's "free" software products, ADR has done so with its AUTOFLOW product for which it has a patent. ADR's software product AUTOFLOW is directed to an automatic system for developing flowcharts of software programming without human intervention. The system that ADR competed with when it placed AUTOFLOW on the market in 1965 was one offered "free" by IBM to its customers. The IBM FLOWCHART[14] system for the IBM/360 hardware was not an automatic system, since the programmer was himself compelled to sketch manually a rough-draft flow diagram of the software programming that he wished to chart. With records of this rough draft of the flowchart, the IBM FLOWCHART software was used to control the hardware to operate in the nature of a drafting machine to draw a finished flowchart. Unlike the IBM "free" software, ADR's AUTOFLOW is fully automatic, the programmer does not have to draw the layout of the flowchart because the machine "plans" it automatically, and thereafter automatically draws the flowchart.

In marketing its AUTOFLOW product, ADR found the potential IBM/360 market totally saturated with IBM's flowcharting program. ADR initially experienced considerable resistance on the part of IBM computer users against paying for a flowcharting program when they got one "free" from IBM, albeit the flowcharting was not automatic. ADR was compelled to invest heavily in educating the market as to the difference between the semi-manual system of IBM and the fully automatic system of ADR,

14. See *IBM Technical Newsletter*," System/360 FLOWCHART," No. N20-0069-0, Sept. 12, 1966.

even though IBM's semi-manual flowcharting was not competitive, neither technically nor in the final flowchart that was achieved. ADR was ultimately successful in the marketing of its product, in one of the first and few instances of such successful competition with IBM's "free" software.

Without reasonable prospects of obtaining a patent, ADR would have been confronted with the situation that IBM could use the concepts of the AUTOFLOW system (for which a patent was finally granted) and develop a system similar to AUTOFLOW and give it away "free." Were that to have happened, ADR's AUTOFLOW business would have been destroyed. ADR has sold or leased more than 1900 units of its AUTOFLOW software product, with gross sales of about 15 million dollars.

The hardware manufacturers' have never contested ADR's AUTOFLOW patent by infringing it. Certainly, their arguments before this Court about "methods of doing business," "algorithms" and "ideas" would have no credibility in a defense of an infringement suit, for the issues would be clear that both ADR and the infringer were both engaged in the sale of automatic machines.

The hardware manufacturers such as the members of *amicus* CBEMA supporting Petitioner have obtained patents for their hardware programming developments; these are the products they price in the bundle of hardware and software that they sell. However, the hardware manufacturers do not wish to be restrained in any way by software patents that companies such as ADR may obtain; for such patents would enable small software companies, as in the case of AUTOFLOW, to enter into competition with the hardware manufacturers even as against the "free" software.

Thus, the software business, in every respect, is concerned with the sale and use of automatic machines and not with "methods of doing business" or "ideas."

2. The facts of the technology and the findings of fact of the C.C.P.A. in this case and in its predecessor cases are that a programmed digital computer is a special-purpose computer or machine that performs machine functions, not a "method of doing business."

The C.C.P.A. findings of fact in prior cases[15] apply to the present case. They are: 1) that general-purpose hardware is structured by software into a special-purpose computer, and the structure of this special-purpose machine is different from that of the general-purpose machine and is determined by the inserted software; and 2) that hardware and software forms of programming are engineering equivalents. Once the facts are recognized, the patentability of the special-purpose machine follows directly from the statutory provision that machines are patentable subject matter. The briefs of Petitioner and CBEMA, the association of the hardware manufacturers, do not deny these findings of fact, but by predicating their attack against the patentability of software programming on "ideas," "methods of doing business," "laws of nature," or "mathematical algorithms" the hardware manufacturers are indirectly attacking these findings and are, in effect, seeking their reversal by this Court.

Instead of a discussion of the software technology, Petitioner and CBEMA argue that since the Johnston patent is to be used by banks, it therefore is a "method of doing business." Such argument flies in the face of the entire nature of the computer program technology, which serves solely to provide machine systems and machine devices. It is not related to a "method of doing business" except that the machine system like all other machine systems may be used by a business.

The processing of data by a human being bears at most a superficial resemblance to the machine process of automatic processing of data by a machine, just as manual

15. *In re Prater*, 415 F.2d 1393 (1969); *In re Bernhart*, 417 F.2d 1395 (1969); *In re Mahoney*, 421 F.2d 742 (1970); *In re Musgrave*, 431 F.2d 882 (1970); *In re Foster*, 438 F.2d 1011 (1971).

sewing with needle and thread only superficially resembles sewing with a sewing machine. The fact that a particular task may be done by a human being does not negate the fact that a machine—rather than an "idea" or "method of doing business"—was invented to perform the same task in a different way.

The published statements of industry experts of all kinds over the past 10 years[16] demonstrate that software is a formal technology for constructing machine systems. Additional evidence can be found in the formal education process that now takes place in universities. Degrees in computer science are now offered at the bachelor, master and doctorate levels through engineering departments of a large number of universities. Such degrees cover, for the most part, the computer engineering disciplines and techniques of building software systems.

From ADR's practical experience with software, it is truly a machine system. ADR personnel are highly experienced and highly educated; they build software machines

16. Software Engineering Conferences, Reports and Articles:

a. First National Conference on Software Engineering—Sept. 11-12, 1975, Washington, D.C.
b. IEEE International Conference on Software Reliability —April 1975.
c. Composite Design; The Design of Modular Programs, IBM, Poughkeepsie Labs, January 1973.
d. Management Concepts for Top-Down Structured Programming. IBM Technical Report—February 1973.
e. Revolution in Programming; Structured Programming; Structured Programming: Top-Down Approach; Chief Programmer Teams—*Datamation* Magazine, Dec. 1973, 50-61.
f. Top-Down, Bottom-up Structured Programming and Program Structuring.—A Report on the Apollo Space Shuttle Software—MIT, Charles Draper Labs, Dec. 1972.
g. Software Engineering. A collection of software engineering articles by industry and university leaders, INFOTECH; State-of-the-Art Series, 1972.
h. The Software Engineering NATO World Conference—October 7-11, 1968 Germany.

using a formal method of design that produces a machine architecture of components and functions that interact to form a machine system. The design is generally developed by a chief programmer and a small team of highly skilled programmers who literally build the software system. Such systems whether simple or complex have a machine architecture, which in no way resembles a "method of doing business," an "idea" or "mathematical formula."

EXAMPLES OF MACHINE SYSTEMS IMPLEMENTED BY SOFTWARE

The following examples of a variety of automated machine systems implemented by software (those of ADR's two software patents and its pending patent application and two others) contradict the assertions that software inventions are "ideas" or "methods of doing business."

A. *AUTOFLOW Flowcharting System*. One unique feature of the software technology is the capability of making "decisions," which has led to the mistaken impression that computers "think." This "decision" feature reveals that a special-purpose computer built by a stored computer program is not (except in a trivial sense) merely a sequence of hardware circuits (or "instructions"). In practice, the program structures many interrelated sequences of those circuits. It is not at all like the player piano that invariably plays the same sequence of chords directed by the holes in the piano roll. The "decision"[17] capability enables the

17. The term "decision" is a rather pretentious one to describe a machine control operation or "selection" which controls processing to follow one of a number of alternative paths of operation. The criteria for selection are the intermediate results of data processing. The technical jargon in the computer field, which is often quite anthropomorphic in suggesting human characteristics where none exists draws upon the only available terminology that we have, and uses existing words with special machine meanings. The hardware manufacturers' arguments about "ideas" are largely and speciously based on this anthropomorphic terminology.

program to jump from one sequence to another and back again depending on the results of the processing of the data at different stages. Thus the sequences of operations vary with the nature of the data being processed.[18]

The ability to perform "decisions" by means of a computer program controlling a general-purpose computer is an underlying feature that makes possible the building of so many different types of machines by software. This "decision" feature does not exist in any way in the player piano, which has a fixed, invariable mode of operation built into its mechanisms. If the piano roll has any analogy to the computer, it corresponds to the data supplied to a programmed computer, but even this analogy is superficial at best, for the player piano reproduces without modification the exact sequence of notes specified by the sequence of holes in the piano roll. However, the data in a programmed computer is processed and the sequence of processing varies under the control of the "decision" circuitry as directed by the software. Thus, a player piano is nothing but a piano, while a general-purpose computer is converted to a special-purpose machine by software, with the structure of that machine being conveyed by the software.

The alternative paths of data processing resemble a maze with an almost infinite number of alternative choices. For example, if there are 50 specific decision points, the number of possible paths is 2^{50} or over a thousand trillion choices (and more than 50 decision points are common within computer programs). The control of data as it passes through the logical maze is not a function of the hardware circuits, but rather a function of the particular software that directs the hardware.

The hardware circuits are so elementary and universal in their functions that it is only in their combinations in intricate sequences determined by the software that the

18. See Jacobs, fn. 2, *supra*, for a discussion of an equivalent hardware technique corresponding to the software "decisions" for producing alternative paths of processing.

features of the special-purpose computer are uniquely established. This is the same characteristic found in the building of any machine out of a combination of structural elements. As the computer (or television) circuits are built out of combinations of transistors, resistors and capacitors, so a special-purpose computer is built out of combinations of the general-purpose computer's functional circuits.

These multidirectional mazes of alternative paths of processing are charted automatically by the AUTOFLOW system (see the Appendix).[19] It cannot "think" and therefore does not know if it is flowcharting a sorter program, a program for analyzing printed characters (*e.g.*, to read and sort mail in a post office), a program for synthesizing voice (so that the blind can receive communications from a computer), or any of a large variety of other programs that a computer center may have (for directing its single set of hardware). The data processing paths of AUTOFLOW are themselves configured in a complex multidirectional maze.

The AUTOFLOW patent,[20] therefore, is directed to a special-purpose computer which in no sense duplicates a "method of doing business." The United States Government, one of the most enthusiastic customers of AUTOFLOW, has encouraged its use because it is not like a manual or mental process: ". . . manually drawn flowcharts often reflect what the programmer intended to have the program do rather than what he coded it to do. By the use of AUTOFLOW, computerized flowcharts are produced which precisely describe what the programmer has coded."[21] Thus, AUTOFLOW is a unique machine system which is constructed with software programming and the

19. In an Appendix, a photograph of a small segment of a flowchart is shown being produced by a computer printer under control of AUTOFLOW. The diamond-shaped blocks in the flowchart are the "decision" points whence flow two or more alternative paths of processing.

20. See fn. 4, *supra*.

21. Goddard News, Public Information Office of the Goddard Space Flight Center, NASA, Dec. 12, 1966, pp. 3, 7.

general-purpose computer hardware with which it cooperates in a synergistic way to overcome the hardware's limitations and achieve the desired flowcharting in a useful form by practical means. This machine system is clearly not mathematics[22] nor an "idea" nor a "method of doing business."

B. *ADR's Sorter Patent.* A second ADR patent[23] is concerned with the most common form of automatic data processing in the commercial field, that of sorting data (*i.e.*, placing data records in numerical or alphabetical sequence). ADR's sorting patent defines a machine in which the sorting is performed on strings of records which are recorded on magnetic tapes which can be "read" or "played back" only when moving in the forward direction.

The machine sorts strings of records on successive tapes, then merges the sorted strings of records and stores the merged records on a tape. The next set of records is similarly sorted and merged, and so on until the tapes all have merged strings of records, whereupon they are merged and stored on one tape. This alternation between sorting and merging is repeated until all of the records are sorted.

This sort-merge construction solves a machine problem of achieving efficient operation where the magnetic tapes can be read while moving in one direction only, and the rewinding of tapes occurs during time periods when its records are not needed for sorting or merging. For that reason it is clear that the software achieves a unique machine construction, and is not an "idea" or "method of doing business" or other non-machine.

Sorting data by a "mental process" would never be done in the way ADR's sorting machine does it. The entire purpose of the patented system is to perform operations at high speed, at millionths and thousandths of a second, and to manipulate the tapes in a certain way to overcome the unique limitations of being readable in one direction only.

22. At ADR, in the development of software products, the special mathematical skills of mathematicians are not used.

23. See fn. 4, *supra*.

This machine system is clearly neither mathematics, nor a mental process, not an "idea" nor a "method of doing business."

C. *The STAR System.* ADR has developed a machine for detecting, reporting and identifying failures and malfunctions that occur in a telephone network of a large number of telephone lines. This system requires, in addition to special circuitry that connects to the telephone lines, a complex control system for automatically monitoring and "interpreting" the progressive changes in state from the initiation of each call on each line to the failure of the call due to a fault or to normal completion or interruption.

This control system is constructed by a stored program and general-purpose computer, and its complexity stems from its ability to simultaneously follow the signals on a large number of telephone lines. The software-controlled machine directs the circuitry to determine which telephone line to monitor at what *millisecond* in time, and provides the type of overall supervision and control that would be associated with an automated factory. The STAR System performs the routine, tedious tasks that might otherwise have to be performed by a large number of people, but which could not be performed as effectively by them, and reduces the amount of circuitry that must be used. The STAR System operates in an entirely different way from that used by humans to monitor operating conditions on telephone lines, ensures complete privacy of those talking on the lines, and because of its great complexity, it could not be practically achieved in the present state of the art with a construction using all hardware programming. It is clearly not a mental or mathematical process, nor an "idea" or a "method of doing business."

D. *Recognition of Printed Characters.* Machine systems have been developed for automatic reading of printed documents. The machines consist of: 1) an input device which produces electrical signals corresponding to

the patterns of black and white print that form a printed symbol (*e.g.*, an optical sensor); 2) an analyzer for processing the signals to identify the symbol; and 3) an output device (*e.g.*, a printer or a control device).

The character recognition analyzer may take a wide variety of forms, independent of the types of input and output devices, and it may be embodied either in software or hardware or some combination of software and hardware, depending on various engineering considerations. Generally, hardware is faster, but it suffers from the disadvantages of requiring a larger investment to tool up for mass production, and it may be too expensive for more complex systems.

The software approach for the character recognition analyzer is more flexible and permits a company to build a machine and to test it out before finalizing the hardware design. In addition, the company can place the machine on the market in the software form for commercial use, and be able readily to modify, enhance and debug it as field use develops. As this technology developed and became more complex, the machine analysis, at least initially, was implemented by software.

The hardware and software forms of a character recognition analyzer are engineering equivalents. The machine structure of a particular analyzer would be generally the same whichever form of programming, hardware or software, were used, so from the standpoint of patent protection, it should make no difference which engineering form is chosen. Hardware manufacturers such as IBM have for many years obtained patents for their character recognition analyzers, which they market in hardware form. A small company should be able to obtain a patent for an innovative character recognition analyzer which initially is embodied in software form, and which subsequently, by that small company or by a hardware manufacturer, may be embodied in hardware form.

In no way is a machine system for recognizing letters and numbers a "mental process," "mathematical algorithm," or "method of doing business." Whether the analyzer is hardware- or software-embodied, a patent would certainly not cover the human process of reading, nor any business method, but only a machine structure.

E. Voice Assembly. Digital computer techniques have been developed for assembling speech from prerecorded syllables in which parts of words are stored in a computer memory, and a special-purpose computer is used to assemble complete words and transmit them to a human operator (*e.g.* in a bank, in response to an inquiry about a depositor's bank balance, or a blind man's request for data from a computer data bank). Such a special-purpose computer may be implemented by software combined with a general-purpose computer, or by hardware programming, or by an appropriate combination of the two. The particular form of embodiment, hardware or software, would not affect the machine system or its functions. In neither case would the patent cover mathematics or a "mental process" (that is, a human process for the assembly of speech) or a "method of doing business."

Summary. In each of these examples of machines (an automatic flowcharter, a sorter, a telephone monitoring system, character recognition equipment, voice assembly equipment) the hardware used may be the same (*e.g.*, the general-purpose computer of any of the hardware manufacturers). The hardware is uniquely structured by the software of these widely different machines as required, without rewiring the hardware and without otherwise changing the hardware or its basic operations. In each of these cases, it is clear, not only is there a machine system distinctly different from a human "mental process," but any patents on these systems would not cover mathematics or prevent the human performance of any "mental process" or "method of doing business." This is especially clear in the ADR AUTOFLOW and Sorter

patents, where the inventions are defined in the claims as machines, rather than machine processes.[24]

3. AUTOFLOW is a machine system that could be converted into a handwired hand-held machine but for economic reasons.

In 1965, ADR conceived of the AUTOFLOW "two-dimensional system for constructing and recording display charts" and in 1970 received a patent on this software machine system.[25]

With the advent of microcomputers and integrated circuits, it is possible to build an AUTOFLOW machine system, completely in hardware, based on the principles covered in the patent. Each of the functions, or groups of functions, could be put into one or more "chips" and the entire machine logic would be the size of today's calculator and would form a "black box."[26] Input/output units in the form of small tape reels (as found in hand-held tape recorders) would be appended to this "black box." In today's technology, the entire machine could be put into a 6" x 12" x 2" or smaller surface and held in one's hand. The price of such a unit might be inordinately high, however. The unit price must reflect the fact that integrated circuits are

24. In accord with the engineering equivalence of software and hardware, is the C.C.P.A. holding in the *Prater* and *Bernhart* cases, *supra*, note 8, that it is appropriate to define the invention as a machine in patent claims using the statutory claim form specified in 35 U.S.C. 112. The 1966 Patent Office Guidelines to the Examination of Computer Programs, 829 O.G. 1, 2, Aug. 2, 1966, also acknowledge the suitability of defining software as a machine device in this fashion. This procedure was followed by ADR in its patents for AUTOFLOW and the Sorting System.

25. Patent No. 3,533,086, fn. 4, *supra*.

26. A "black box" is a term used for a machine (in a casing or box) when the user does not care and is not concerned about the "internal logic" of the machine. The user is only concerned with the function the machine or "box" performs.

expensive to design, and produce. Generally, a minimum volume of 50,000 units would have to be produced before the cost of development could be recovered.[27]

There are reasons other than "volume minimums" to reflect on before business decisions would be made for building a hardware version. AUTOFLOW logic changes to reflect new kinds of input and to incorporate improvements in the output, based on the experience of users. Software, although long-lived,[28] is "volatile," (*i.e.*, easily changed). However, had the software been put into hardware, it would have obsoleted the system at a much quicker pace, which is a common experience with automatic machines of the rigidly fixed type such as hardware.

In conclusion, AUTOFLOW as a machine could theoretically be composed of hardware only and not require the use of a general-purpose computer for "the functioning of the machine." Depending on the economics and other trade-offs between hardware and software, much of today's software might well be put in hardware, since it is possible to convert all software-constructed machines into hardware machines for they are both formed of *interacting circuits*. The interaction or "dynamic interrelationship" (to use the Government's term)[29] among the circuits of the general-purpose computer that is produced by the software is the structure of the software-constructed machine. The same structure is produced by the "dynamic interrelationship" between

27. *Scientific American*, May, 1975, "Microcomputers," 32, 39.

"These specially made integrated circuits can be justified only when they are produced in volumes large enough (50,000 units, say) to amortize their development costs."

28. AUTOFLOW, a product of the mid-1960's is still viable. IBM's operating system, which is built as an "extended machine" of the IBM hardware, and much of today's software originated over 10 years ago.

29. "We acknowledge the dynamic interrelationship between general purpose digital computers and the software programs." (Pet. Br. 36).

the circuits of the hardware-constructed machine. The difference between the two machines is that the "dynamic interrelationship" is achieved by electrical signals in software and by fixed wire connections in hardware. As the latter is patentable, so is the equivalent software; for one who builds machines with software is also working in the "useful Arts."

4. The proposals of IBM and the other hardware manufacturers for copyright or other forms of protection of software would reverse the constitutional policy of an incentive to innovation in the "useful Arts."

IBM and the other hardware manufacturers represented by CBEMA have fully appreciated the technological equivalence of hardware and software and have built their hardware and software on that technological principle.[30] However, they propose that the patent system continue to be used for legal protection of their hardware systems, but not for the equivalent software. Instead of patents, they propose that some registration system (copyright or other forms) be used for the software type of machine.

The hardware manufacturers would turn upside down the constitutional policy underlying the patent system. The grant of patents for a machine is limited to the *innovation* in that machine, as the Court has unequivocally stated (*Graham v. Deere*, 383 U.S. 1, 6):

> The Congress in the exercise of the patent power may not overreach the restraints imposed by the stated constitutional purpose. Nor may it enlarge the patent monopoly without regard to the innovation, advancement or social benefit gained thereby. Moreover, Congress may not authorize the issuance of patents whose effects are to remove existent knowledge from the public domain, or to restrict free

30. See fn. 11, *supra*.

> access to materials already available. Innovation, advancement, and things which add to the sum of useful knowledge are inherent requisites in a patent system which by constitutional command must "promote the Progress of * * * useful Arts." This is the *standard* expressed in the Constitution and it may not be ignored.

A registration system (whether copyright or otherwise) is intended to protect noninnovative features of the machine system embodied in the detailed coded instructions of the software. Such protection is clearly proscribed by the Constitution. Furthermore, that proposal would have the constitutionally innovative features pass into the public domain. Therefore, the constitutional policy of providing an incentive to "innovation," would not be served by the CBEMA proposals; it would be circumvented.

ADR views itself as an innovative company and wishes to compete on the basis of the improvements that it brings to the software arts. It believes the patent system will supply an incentive for making sorely needed advances to this software technology as it has to others, including that of the equivalent hardware.

The hardware manufacturers, which have substantial monopoly positions in the software that they supply with their hardware,[31] seek a registration system for protection of the non-innovative features of their software and would deny to innovative competitors the incentive that is the basic rationale of the patent system.

Besides stimulating innovation, patent protection will enable other small software companies to compete with the hardware giants, as it did *amicus* ADR. It will end

31. See Judge Rich's opinion below (Pet. 20A) which notes that the "major hardware . . . manufacturers and their representative associations . . . for economic reasons, [do] not want patents granted *on programs* for their machines." (Emphasis in the original).

the reliance on trade secrets as the only means to protect innovative software, which has had the effect of inhibiting the free flow of information.

The Patent Office and the hardware manufacturers were unable to persuade the Congress in 1968 to legislate exclusion of computer program inventions from patent protection, and Congress found unpersuasive the Report of the President's Commission on Patents on this issue.

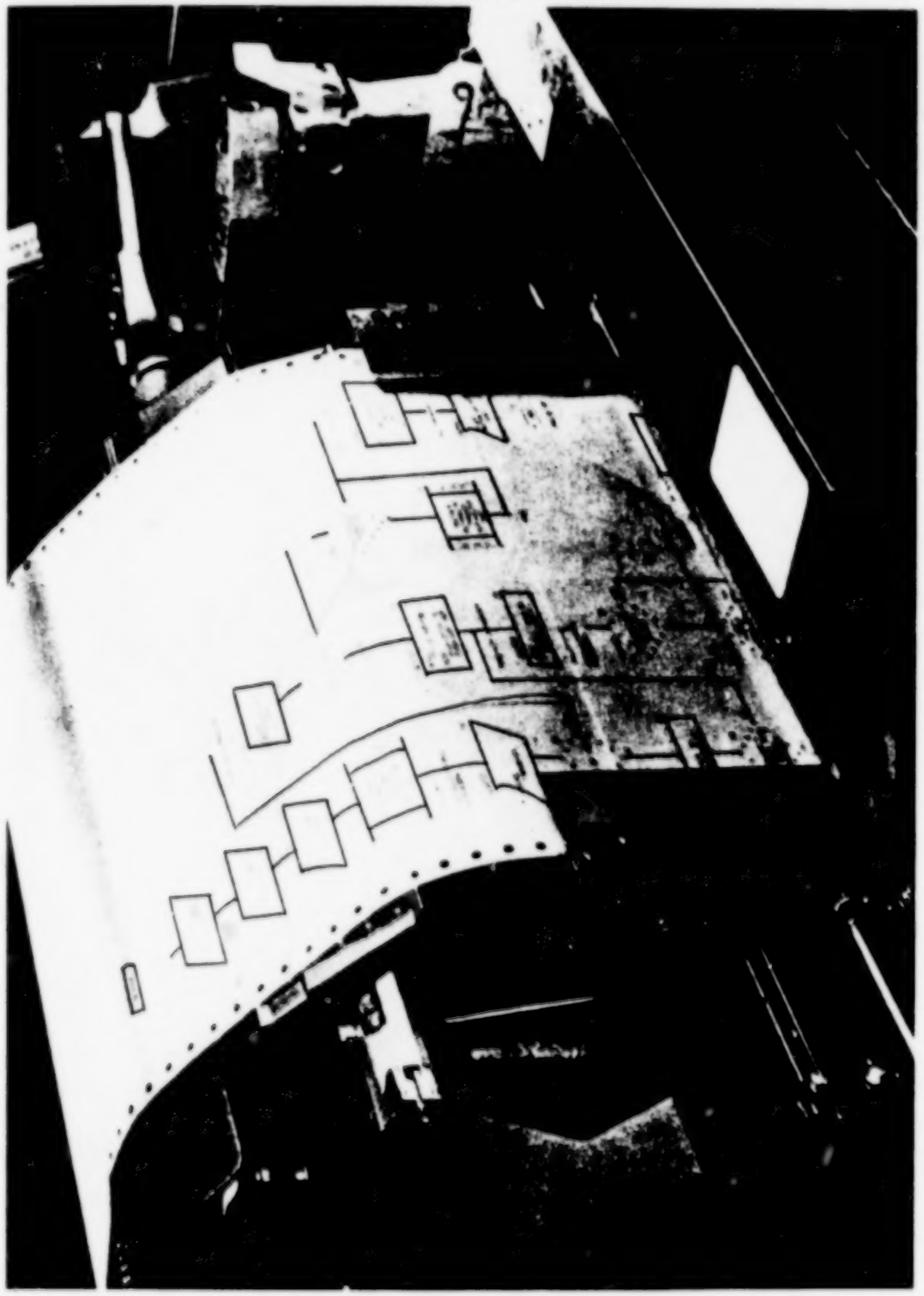
CONCLUSION

The findings of fact and conclusions of law of the Court below are soundly based, and its decision should be affirmed.

Respectfully submitted,

CAROL A. COHEN
Attorney for Amicus Curiae,
Applied Data Research, Inc.

AUTOMATIC FLOWCHARTING WITH
PATENTED ADR AUTOFLOW SYSTEM



Supreme Court, U. S.
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IN THE

SUPREME COURT OF THE UNITED STATES

October Term, 1975

No. 74-1033

C. MARSHALL DANN,
COMMISSIONER OF PATENTS AND TRADEMARKS,
Petitioner

v.

THOMAS R. JOHNSTON,
Respondent

On Writ of Certiorari to the United States Court
of Customs and Patent Appeals

**Brief Amicus Curiae for the
Association of Data Processing Service Organizations,
Software Industry Association
(ADAPSO/SIA)**

DAVID COHEN
Attorney for Amicus

ADAPSO/SIA
1420 Walnut Street
Philadelphia, Pa. 19102

THE LEGAL INTELLIGENCER, 66 NORTH JUNIPER STREET, PHILA., PA. 19107 (215) 561-4850

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IN THE

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C. MARSHALL DANN,
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On Writ of Certiorari to the
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BRIEF AMICUS CURIAE FOR THE ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS, SOFTWARE INDUSTRY ASSOCIATION (ADAPSO/SIA)

The Association of Data Processing Service Organizations, Software Industry Association, files this brief *amicus curiae* in opposition to Petitioner, and also files letters of consent of the parties in accordance with the Rules.

QUESTIONS PRESENTED

1. Whether the writ of *certiorari* should be dismissed in a case in which the record is inadequate, there is a jurisdictional barrier to the consideration of a central issue, and the principal question for which *certiorari* was requested cannot be resolved?

2. Whether an otherwise patentable special-purpose machine becomes unpatentable solely because it is constructed by programming a general-purpose computer?

INTEREST OF AMICUS CURIAE

Association of Data Processing Service Organizations, Software Industry Association (hereinafter ADAPSO/SIA) is a nonprofit trade association of 62 companies in the computer field,[1] approximately 70% of whom concentrate their attention in the software products industry, and the remainder largely in the furnishing of varied software services to computer users and to hardware manufacturers.

ADAPSO/SIA presents its views to the Court because an inaccurate description of software technology and the software products industry has been set forth by Petitioner's Brief and the supporting brief of the hardware manufacturers' association, CBEMA.

ADAPSO/SIA companies are not "idea or think tanks." They are companies engaged in building and marketing machines for which profit-conscious companies will and do expend money. ADAPSO/SIA's members believe they are entitled to the same patent protection for their innovative products as that granted the hardware manufacturers.

---

1. ADAPSO/SIA (ADAPSO/Software Industry Association) was formed by merger in June 1972 of the Software Products and Service Section of ADAPSO and the Association of Independent Software Companies (AISC), the latter comprising 8 companies and the former 25 companies.

NATURE OF THE INDUSTRY

A. *The Absence of Competition in Software.*

Whereas ADAPSO/SIA is an organization of relatively small companies, with no one company exerting dominance over all the others, CBEMA is an organization of relatively large companies, operating in a computer hardware industry "shaped and dominated by IBM."[2] IBM's dominance is such that its 70% or better share of the computer hardware market is nearly ten times that of its nearest competitor, Sperry-Rand.[3] Other giant companies such as Honeywell, Burroughs, Control Data and National Cash Register are compelled to share the remaining portion of the market; General Electric and RCA found themselves forced to withdraw entirely from competition. Thus, it is IBM's voice and actions which have and which do dominate the computer industry.

In this case the Government remains silent while CBEMA distorts the history of the computer industry to assert that "the computer industry has developed in an atmosphere of free interchange of computer programs. . . ."[4] How "free" the atmosphere has been in the computer industry is best shown by the Government's pretrial brief in *United States of America v. International Business Machines Corporation*.[5]

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2. Government's Pretrial Brief, *U.S. v. IBM*, 69 Civ. 200, S.D.N.Y. (hereinafter Pretrial Br.)

3. See Report, Brooks Subcommittee on H.R. 4845, Aug. 17, 1965, 89th Cong. 1st. Sess. (House Rep. No. 802) "Domination of ADP Industry by IBM," p. 11.

4. CBEMA Brief 10-12.

5. Pretrial Br. *supra*.

See also Berteau, "IBM and the Structure of the Industry, The Software Monopoly, 21 *Datamation* 111, October, 1975:

> We have seen hardware technology continue to advance at a rapid pace but the systems architecture seems to stay the same. Have you wondered why? The answer is *software*. As long as the structure of system software is fixed, innovation in system architecture is limited. . . .

The Government in its antitrust action against IBM notes the development of the computer industry and finds that in "the earliest days of the development of the computer industry, there was nothing that could be identified as a software industry."[6] This was in part because users design some of their own software and because the "computer systems manufacturers, following IBM's lead, provided [free] much of the software [that] users required."[7]

It was not until the late 1960's that "the independent software *products* market emerged, pioneered by the firm Applied Data Research, Inc.,"[8] one of the *amici* herein. As the Government notes, "in light of the fact that IBM provided its customers with their software requirements as part of the IBM 'total systems solution,' independent software product firms had to market their offerings against products for which there was no identifiable price. As a result, only those companies which could offer products not available 'free' from IBM or which could demonstrate the technological superiority of their products in comparison to IBM's had any chance of survival."[9] The result was that

Note 5—*Continued*

> The most significant reason for this situation probably lies in the history of software building by manufacturers. It's just not in the manufacturers' interest to produce optimum system software. It might result in the manufacturer selling less iron. . . .
>
> The solution to the software building problem brings us to a real issue facing the industry today—monopoly and restraint of trade in software. We have a small but significant competitive market in applications packages. There is very little competition in sorts and compilers, almost no competition in data communications access methods, and no competition in operating systems. And unless the U.S. antitrust lawyers understand the significance of this, we'll have even less competition in the future.

The author is identified by the magazine as "a holder of one of the early software patents."

6. Pretrial Br. 28.
7. Pretrial Br. 28.
8. Pretrial Br. 28.
9. Pretrial Br. 29.

the independent software product firms lacked "a realistic opportunity to compete."[10] That this was not an innocent case of cause and effect was shown by IBM internal memoranda which revealed that "the value of this exclusionary effect derived from bundled pricing [so-called free software][11] was fully appreciated by IBM . . . The effect of IBM's ability to wield such exclusionary power has been felt most acutely . . . by those firms seeking to market software products."[12]

The Government has also noted that "IBM internal memoranda . . . reflect that from as early as 1965, IBM was aware of the marketing benefits derived from bundled pricing and the anticompetitive effect it had on software companies."[13] The net effect was that "bundled pricing enabled IBM to exclude competition from independent software vendors."[14]

The Government concludes that its study of IBM documents "illustrate without ambiguity that its bundled pricing marketing approach was a practice known by IBM to be legally indefensible. Nevertheless, IBM consciously continued bundled pricing because of the competitive leverage it afforded IBM in maintaining its monopoly position."[15]

Software monopolies are also maintained by other hardware manufacturers through the use of bundling. A small software company has sued Sperry Rand, charging it with refusing to place a price on its bundled software and thereby making it impossible for the small company to sell

10. Pretrial Br. 29.
11. The Commissioner of Patents punctured this boasting of free software in 1968: "Today, the only significant free contribution of software to the public comes from the universities and other organizations dedicated to research rather than profit." Brenner, Commissioner of Patents, "The Future of Computer Programs in the U.S. Patent Office," *Law of Software*, 1968, pp. B-1, 3.
12. Pretrial Br. 201.
13. Pretrial Br. 205.
14. *Ibid.*, 207.
15. *Ibid.*, 236.

its software in competition.[16] Honeywell in bundling its software and hardware asserts that the software is "free." But when the hardware buyer attempts to transfer that software along with the hardware to another company, Honeywell claims that it owns the software and will control who can have possession.[17]

B. *The Resulting Poor-Quality Software.*

The CBEMA brief also boasts of "The tremendous growth of the computer software industry and the vast number of breakthroughs in the field of programming, which have occurred in the last two decades" (CBEMA Br. 12). How different the facts really are in the computer software field is made clear by the testimony of Dr. Ruth M. Davis, Director of the Center for Computer Services and Technology of the National Bureau of Standards[18] characterizing the present condition of software as "poor-quality software," a condition which she described as the "crucial computer problem" confronting the nation today. Speaking on the "seriousness of the problems besetting both the consumers of computer products and services and the suppliers of these products and services" Dr. Davis stated:

> The crippling problems are lining up in the software rather than in the hardware field. In particular, they fall under what we call the application-independent problem category . . . these are the software problems which are common to many applications.

That the condition described by Dr. Davis in 1972 still holds true is seen by her warning at the CBEMA Spring meeting, May 29, 1974 that "the difficulty and cost of

16. *Computerworld*, November 20, 1974, p. 45.

17. *Computerworld*, August 6, 1975, p. 1.

18. Testimony given before the Government Activity Subcommittee, House Committee on Government Operations, May 16, 1972.

developing and maintaining quality software have become the single largest consideration in computer utilization and composes a serious limitation on the cost-effective use of computers."

Even IBM acknowledges that "the biggest problem facing programming today is the extreme difficulty and cost encountered in creating and maintaining large programming systems."[19] At the National Computer Conference held early this year it was admitted by a leading hardware manufacturer that the "software dinosaur" has not "kept pace with the technical needs of the industry."[20] As a result of the software users being at the mercy of the hardware manufacturers, the users are forced to make do with the "free," poor and technically inferior software.[21]

The reason for the poor state of the development of software lies in the shackles IBM has placed upon free competition. History shows that it has been small technological companies and independent inventors, and not the vast financial combines such as IBM, which have been responsible for much of the innovation of this age. A recent govern-

19. The IBM report from their Poughkeepsie Laboratory — "Composite Design: The Design of Modular Programs" Jan., 1973, p. 3.

20. " 'Software Dinosaur' Slows Growth," Univac Vice President Neil Gorchow, Sperry Rand, *Software Digest*, Vol. 7, No. 20, May 22, 1975, p. 2.

21. "155, 165 Owners Angry With IBM," *Datamation*, August, 1974, p. 76. The "free" software of the hardware manufacturers has been described by a professional for 24 years in electronic data processing (EDP): ". . .Computer systems are in many cases defective. They are primarily defective in the computer programs that come with the hardware — the body of programs referred to as the 'Operating System' . . . a sort of executive in managing the work of the many parts of the computer system, . . .[the] housekeeping chores . . . [A] very big set of programs [that] is often inefficient, overcomplicated and unreliable . . . [t]he outrageous fact remains that the Operating System is often an imperfect and incomplete product which typically contains errors, omissions and inconsistencies. ("EDP — A 20 Year Ripoff," INFOSYSTEMS, 11/74, pp. 26, 27, 29.)

ment report has found that "studies of the sources of invention and innovation have shown that independent inventors and small technologically based companies are responsible for a remarkably high percentage of the important inventions and innovation of this century.[22]

C. *The Small Company Potential For Competition.*

The small, mostly "young and struggling", companies who "surely possess excellent technical innovative capabilities" and "the principal technical capability . . . to work . . . on our critical computer problems"[23] have been wrongfully denied the incentive of the patent system, which has been assured to the hardware manufacturers for products they sell. The patent incentive is both a form of recognition and a major aid in obtaining the necessary financing without which these companies face the prospect of shriveling and dying. It is no accident that the monopolistic and exclusionary practices of IBM have permitted only a small number of companies in the software products field to achieve a relative degree of success. As the Government states in its pretrial brief "operating systems continue to be part of IBM's bundled price structure. These continue to be bundled for the marketing leverage they afford IBM in terms of increasing the sale of IBM computer equipment and forestalling the growth of independent software companies."[24]

D. *The Importance of Patent Incentives.*

A patent on a software program creates an economic toehold in the monopoly-dominated computer field. The software products company characterized by the Government as the pioneer in the independent software products

22. National Bureau of Standards Experimental Technology Inventives Program, Preliminary Program Description, Fiscal Year 1973 Budget Submission, p. 9.

23. Davis, Committee Testimony, p. 15, *supra*.

24. Pretrial Br. 226.

market, Applied Data Research, Inc.,[25] stands as proof of the importance of software patents.[26]

To a large financial giant, the economic value of a patent may not loom large; to the small software companies upon which the future of the development of quality software depends, the financial value of the patent may spell the difference between life and death. To banks and financial institutions the existence of a patent or even the potentiality of obtaining one may well be a decisive factor in determining whether a loan should be granted. To prospective investors a patent or the possibility of obtaining one may be the principal element in the decision whether to invest.

Making clear that patents may be available for inventions in software would unleash enormous innovative talent. It would have the direct opposite effect forecast by IBM and the other hardware manufacturers—it would enable competition with those companies and provide the needed incentive to stimulate innovation.

Patent protection would encourage the free dissemination of program innovations which is so necessary to stimulate technological progress. Disclosure is the statutory price paid by the inventor for patent protection. Without such protection inventors principally have to rely on the law of trade secrets in order to secure the economic value of their inventions, thereby excluding from the world-at-large disclosure of the invention.

When the Patent Office for its own convenience[27] urges that inventors rely on trade secrets in lieu of patents,

25. Pretrial Br. 28.

26. *See* ADR *Amicus* Brief filed herein.

27. In 1966 the Patent Office issued Guidelines which based upon the facts of the technology, provided for the patentability of computer program inventions "Guidelines to Examination of Programs," 829 *Official Gazette*, 441, 442, July 6, 1966. In 1968, the Patent Office issued a set of Revised Guidelines, "Guidelines to Examination of Programs," 855 *Official Gazette*, 829, 830, October 22, 1968, based upon "policy" (*i.e.*, not legal reasons) limiting

it is ignoring the mandate of the Patent Laws, and when it urges copyrights as another potential alternative, it is denying the inventiveness of an entire technology, thus abdicating its responsibility under the Patent Laws to grant patents for machines that "advance the Progress of the useful Arts."

Such computer programs as are freely disclosed in the trade literature of the computer industry have little economic value or technological worth. All that this kind of "free exchange" has produced for the computer industry has been "crippling problems" and "poor quality software." The real strides forward in computer development occurred in hardware, an area fully protected by the patent laws. In a competitive economy, that which is given away for nothing tends to have the same value. Non-profit companies are non-existent in the computer industry. CBEMA favors its version of "free interchange of programs" because that has been one of its major techniques in excluding competition and in monopolizing the computer industry. It is profits and not "free interchange of programs" or "innovative software that CBEMA seeks.

The economic forces opposed to patent protection were clearly identified by Judge Rich in his dissenting opinion below. As he stated it:

> On the one side . . . against patenting programs or software [were] collective forces of major hardware (*i.e.*, computer) manufacturers and their representative associations who, for economic reasons, did not want patents granted *on programs* for their machines. (Emphasis in the original.)

This portion of Judge Rich's "dissent" (a dissent whose purpose was to provoke this Supreme Court review to

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Note 27—*Continued*

severely the grant of patents in this area on grounds of administrative convenience, Brenner, *Law of Software*, *supra*, B-12.

obtain a ruling providing for software patents)[28] is ignored by the Government as is the fact that Judge Rich reaffirmed his view as to the soundness of his previous opinions on computer technology.

When one knows that every action taken by IBM has been motivated by its monopolistic and exclusionary desires, one understands why IBM has led the legal fight against patents for software. It is not to strengthen the computer industry but only to strengthen IBM's stranglehold upon it that IBM postulates its legal theories in opposition to patents. Strange indeed is it that the Government despite its firsthand knowledge of IBM's efforts aimed at "forestalling the growth of independent software companies"[29] joins hands herein with IBM in furtherance of IBM's monopolistic endeavors.

To arbitrarily deny patent coverage as urged herein by the Patent Office is to denigrate software technology and to cast a chilling effect upon inventiveness.

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28. Rich, "Change," 2 *APLA Quarterly Journal* 214, American Patent Law Association, Fall, 1974): "I do not see how the Patent Office can avoid at least trying to get certiorari granted in *Johnston*, as I implied in my dissenting opinion, in which, by the way, I do not abandon my personal beliefs about what §101 means, as expressed in the C.C.P.A. *Benson* opinion, ..."

29. Pretrial Br. 226.

SUMMARY OF ARGUMENT

The writ of *certiorari* should be dismissed as improvidently granted, because of the inadequate record, the jurisdictional barrier to the reconsideration of a central factual issue, and the inappropriateness of the principal question for which *certiorari* was granted. To consider what the Patent Commissioner presents as the key issues in this case would require this Court to undertake a thorough inquiry into the complex technological issues of special-purpose computer construction, but the record does not provide the factual basis which would enable the Court to do so. The Supreme Court is not the appropriate forum for initial fact finding.

The most basic technological issue — the Board of Appeals' finding that programming a general-purpose computer restructures the computer into a different machine— is not jurisdictionally subject to review because 35 U.S.C. §141, *et seq*. bind the Commissioner of Patents by Board determinations. Since the Board is the *alter ego* of the commissioner, his attempt to appeal its finding is in essence a nonjusticiable intra-agency dispute. Moreover, the C.C.P.A. and the Board have considered the basic technological fact issue, each has special credentials of technological expertise and both have found in favor of the restructuring principle.

The broad question for which *certiorari* was granted— whether innovative machines which can be embodied in computer programs are patentable subject matter— is inappropriate for judicial resolution in this case because patentability depends on the structural nature of the specific invention not which of alternative types of construction was employed. The petitioner has conceded that the Court cannot formulate a rule of general applicability in its decision of this case and that the only other question presented—obviousness under 35 U.S.C. §103—is not worthy of this Court's attention.

The petitioner's main legal arguments depend on a mischaracterization of computer program technology. An

accurate picture of this technology reveals that a programmed general purpose computer is a different machine than the unprogrammed machine. The designer of software, like any engineer, builds machine structures, not methods of doing business; he develops machine solutions for machine problems. Computer innovations embodied with stored computer programs are legally entitled to the same patent protection as innovations embodied in wire-connected electronic circuits, for technologically "hardware" and "software" are equivalent.

The *facts* that a programmed computer (what respondent defines as his invention) is a machine and the innovative aspect of it is a machine structure cannot be overcome by petitioner's *legal* arguments. A machine is not a method of doing business. An innovative machine structure is not the mere embodiment of an abstract idea. Machines are patentable subject matter and respondent's only argument against software being patentable subject matter is the unsupported statement—appealing perhaps to a layman but universally rejected by the experts—that a program is not a machine but merely an idea, "new use," or "method of doing business."

Patent protection for software is vital to the health of the data processing industry. In a field dominated by IBM, the growth of the small independent software company has been stifled by the bundling practices of the hardware manufacturers which continue to this day in the systems programs area. Only through the availability of protection for their products can the software producers hope to bring competition to an industry that sorely needs it.

The absence of patent protection has forced reliance on trade secrecy and has had the negative effect of deterring disclosure of innovations. The availability of patents, with their public disclosure requirement, would "promote the progress of the useful Arts," in this most sophisticated, pervasive and vital area of technology.

Copyright protection is inadequate and inappropriate to protect innovative machine structures. Copyright of a

particular set of computer language statements does not protect the novel machine structure that is the core of any software invention. The Constitution establishes innovation as the prerequisite for a grant of exclusive rights to machine structures; attempts to protect them via copyright or registration run counter to this principle.

At stake in this case is equal patent treatment for the products of small software companies. The myth perpetuated by the Government and CBEMA — that computer-program embodied inventions are not machine inventions —has been exploded; there is now no justification for the denial of patent protection to software-embodied machines.

I. THE WRIT OF CERTIORARI SHOULD BE DISMISSED.

A. The record in this case is insufficient to permit consideration of the questions presented by the Government.

This Court is being asked by the Patent Office to rule on important factual issues concerning the technology of computers and computer programs. There is no record below that develops the nature of this technology. The Patent Office has not tendered to this Court or to the Court below any technological evidence supporting its position, nor could it seek to introduce any such evidence at this stage of the proceeding.[30] Since the record "is insufficient to permit decision of [the] claims,"[31] the writ of *certiorari* should be dismissed, *see Massachusetts v. Painten*, 389 U.S. 560.

The major technical fact issues raised by the legal contentions include:

a) Does programming a general-purpose digital computer restructure the computer into a new machine with a different structure? The Patent Board of Appeals, based on its technical expertise,[32] found that it does (Pet. 28A). The finding was not, nor could it have been, appealed to the C.C.P.A.[33] The Patent Office now asks this Court to overturn its own factual finding by arguing that the invention is not a machine structure but a "new use." CBEMA asserts that the invention is merely a "method of doing business." Neither the Patent Office nor CBEMA has offered one iota of evidence to support those arguments.

b) Are hardware- and software-built embodiments of the same machine technologically equivalent? The Patent Office's request for a ruling that a software built ma-

30. *See* 35 U.S.C. §144, which limits the C.C.P.A. to deciding the appeal "on the evidence produced before the Patent Office."

31. *Johnson v. Massachusetts*, 390 U.S. 511.

32. *See* 35 U.S.C. §7.

33. 35 U.S.C. §141, *et seq*.

chine system is unpatentable solely because it is built in software is at odds with the fact that special purpose computers can be built equivalently in hardware or software. The Patent Office relies only on contrary assertion and metaphor to attempt to justify different treatment under the Patent Code for the equivalent software-built machines, but can show no supporting evidence in the record.

c) Are the innovative aspects of computer programs generally and respondent's invention in particular machine structures? The Patent Office (*i.e.*, the Patent Board of Appeals) held that the invention is a special-purpose machine and a different machine from an unprogrammed general computer. The Patent Office and CBEMA now seek to offer an undocumented view of the programming technology which attempts to characterize programming (i) as an abstract activity unrelated to any specific machine structure and (ii) as a "routine" implementation of abstract ideas or a method of doing business. There are no facts in the record to support the assertions of the Patent Office or CBEMA.

This Court, unlike the two tribunals below, is not specially equipped, in the absence of a record, to deal with the intricate technological fact issues sought to be raised by the Patent Office.[34] This Court has recognized that in technical areas it should avoid disturbing the findings below, *see Brenner v. Manson*, 383 U.S. 519, 532. It is not appropriate to review technological issues without a record. Rather the Court should leave to other "parties whether

34. The Examiners-in-Chief of the U.S. Patent Office Board of Appeals are uniquely qualified by way of training in engineering and science to cope with the technology, *see* 35 U.S.C. §7 ". . . the Examiners-in-Chief shall be persons of competent legal knowledge and scientific ability." Likewise at the C.C.P.A., the judges have the assistance of specially qualified technical advisors with scientific ability. In addition, three of the judges are professionally trained in engineering and science having come out of a patent law background.

or not participants in [this appeal] a further opportunity to contest the matter on plenary records developed in litigation elsewhere. . . ." *Glidden v. Zdanok*, 370 U.S. 530, 579.

B. This Court is without jurisdiction to reverse findings of the Patent Board of Appeals favorable to respondent.

The Patent Office now asserts that programming a general-purpose computer does not restructure the machine but is merely a "new use" of the machine. This allegation has no basis, as the Board of Appeals held in a finding binding upon the Patent Office (Pet. 28A). This Court is without jurisdiction to reverse that finding.

The Board accepted restructuring as a technological fact beyond dispute, noting that the contrary view was "invalid." The Patent Office never sought to raise the restructuring issue in the C.C.P.A., nor by statute could the Patent Office appeal from that or any finding of its own Board of Appeals. 35 U.S.C. §141, *et seq*. The law is clear that only the applicant and not the Patent Office may appeal from the Board of Appeals to the C.C.P.A. and that the jurisdiction of the C.C.P.A. "extends to and embraces none other than the adverse decision from which appellant has [taken an] appeal." *In re Melott*, 331 F.2d 887.

28 U.S.C. §1256 limits the scope of this Court's appellate review to "cases in the C.C.P.A." That section must be read in light of the intent to bind the Patent Office implicit in the jurisdictional limitations of 35 U.S.C. §141, *et seq*.[35] Because the restructuring issue was not and could not have been in the C.C.P.A. case it cannot be considered by this Court.

The Patent Office attempt to raise its legal theory of "new use of an existing machine" also violates the legal

35. The Supreme Court has found it "appropriate that the Commissioner be bound by Board determinations." *Brenner v. Manson*, *supra*, at 523, fn. 6.

principle that no matter may be argued at the appellate court level which has not previously been raised before the lower court. That principle has particular applicability in this instance where the C.C.P.A.'s "special competence in complex, technical and important matters,"[36] would be indispensable.

Furthermore, the restructuring issue is not justiciable because the Patent Office is in reality seeking to appeal from itself. The Board of Appeals is the *alter ego* of the Commissioner of Patents and speaks for the Patent Office.[37] The Patent Office through the Board of Appeals has ruled that a programmed general-purpose computer is a different machine from an unprogrammed general-purpose computer. The Commissioner seeks to utilize the Supreme Court as an instrument for reversing his *alter ego* the Board of Appeals. Such intra-agency disagreements are not appropriately resolved by the judiciary. That is the reason the Commissioner by statute has no right of appeal from the Board of Appeals and why this Court must accept the determination of the Board on the restructuring issue.

C. *The basic question for which review was sought in this case—whether novel and unobvious machines constructed by programming a general-purpose digital computer are patentable—cannot be resolved by a decision in this case and Petitioner so concedes.*

This case was presented to the Court as a vehicle for deciding the broad issue of patentability of computer programs. That issue is the focus of both the Patent Office *certiorari* petition and its brief, which ask the Court to fashion the general rule that software-built special-

36. *Glidden Co. v. Zdanok*, 370 U.S. at 560.

37. See *Brenner v. Manson*, *supra*, at 523, fn. 6.

purpose computers are unpatentable subject matter.[38] This Court cannot issue such a rule of unpatentable subject matter under §101, based on the way a machine is built without violating the spirit and letter of the patent statute. Whether a particular machine constitutes patentable subject matter depends on the well-established principles of patent law—not whether the machine is built with one form of construction (software) as against another (hardware).

This Court cannot rule that all programs are unpatentable any more than it could rule a radio built with vacuum tubes is patentable, but if built with transistors, is unpatentable. The patent statute is broadly drafted, defining as patentable all machines regardless of the technology by which they are built. The only exception of a particular technological field, that of atomic weapons, is explicitly defined by Congress, 42 U.S.C. §281(a). Even the Patent Office in its reply brief concedes the "possibility of patentability" (R. Br. 2) of some programmed computers thereby negating any general ruling applicable to all programmed computers. Since all parties agree that there can be no answer to the broader question, the writ should be dismissed.[39]

The only other basis for decision offered by the Patent Office is the specific issue of the unpatentability of respondent's invention under 35 U.S.C. 103 for obviousness. Petitioner concedes this issue is not worthy of the Court's attention (Pet. 17, n. 10). The Patent Office does not urge that the incorrect legal standard was applied by the C.C.P.A. Instead the Patent Office merely repeats its

38. The Patent Office concedes that the remaining specific issue of the patentability of respondent's invention under 35 U.S.C. §103 is not certworthy, Petition for Certiorari 17, n. 10 (hereinafter referred to as "Pet."; the Brief for the Petitioner is referred to as "Br. Pet.").

39. The dismissal of *certiorari* would not leave the C.C.P.A. decision as a final adjudication of the patentability of respondent's invention. The validity of any patent that may issue to respondent may be fully attacked in an *inter partes* proceeding, (*see* Reviser's note to 35 U.S.C. §144) where a full record could be developed, *see Glidden*, *supra* at 578-79.

factual analysis of the content of the prior Dirks patent, which analysis was rejected by the CCPA. Thus the obviousness issue does not raise "an important question of federal law," (Sup. Ct. Rule 19) nor does the CCPA's mode of fact finding "conflict with applicable decisions of this Court," *id*. Unable to decide the general issue for which certiorari was sought and granted, this Court should exercise its discretion to decline to review the case and dismiss the writ of certiorari as improvidently granted.

II. SPECIAL-PURPOSE COMPUTERS BUILT BY PROGRAMMING A GENERAL-PURPOSE COMPUTER ARE MACHINES, HENCE PATENTABLE SUBJECT MATTER.

A. *The technology of computers and computer programs.*

A modern digital *computer* is an electronic machine that has the capacity to perform various data processing functions. The operation of a computer, like that of any automatic machine, is controlled by a program.

A *program* is a control mechanism which determines that each part of a particular machine system functions as required in order to achieve the desired result.[40]

A *fixed-purpose computer*, sometimes known as a "single-purpose computer," has one program physically built into its circuitry and thus can perform one and only one function. The program in such a machine is generally in its circuitry in the form of a configuration of sub-circuits or a predetermined sequence of switches or electronic impulses.

40. In earlier forms of automatic machines, programs "consist[ed] of mechanical parts such as gears, cams, and linkages that connect the various portions of a machine together and determine[d] the timing of the various actions of the machine." In modern computers, the program consists of the states of electronic circuits and "may be stored in the form of punched paper cards, paper tape, magnetic tape, ferrite cores, electronic circuits, or other mechanical or electronic memory devices." 2 *New Encyc. Britannica: Macropaedia*, 505, 506, "Automation"

A *general-purpose computer*, sometimes called a "programmable computer," can perform no function by itself without containing a program, as is true of any automatic machine.[41]

Both a general-purpose computer loaded with a particular program and a fixed-purpose computer are referred to as *special-purpose computers* because they can perform one particular function. The only difference is that the program in the fixed-purpose computer is permanently wired in (sometimes called "hardwired") while the program in a general-purpose computer is stored in the form of the states of electronic circuits (sometimes called "softwiring"). These two forms of construction are generally equivalent and functionally interchangeable.

The phrase "patents for computer programs" as used by the Patent Office to describe the key issue in this case, is technically imprecise and misleading in that what is sought to be protected in this technology is not some abstraction unrelated to a machine, but the structure of a particular special-purpose machine which may be produced by the softwired or programmed general-purpose computer but which also may be hardwired.[42]

The designer of a special-purpose computer is faced with the task of creating circuitry to achieve a particular goal or function. Prior to the advent of the stored program for a general-purpose computer, such complex circuitry had to be built by physically wiring the components. The great technological advantage of the stored program concept is that it permits the creation of circuits by the use of electronic signals without requiring externally made physical

41. *E.g.*, an automobile engine without camshaft or distributor cannot function.

42. "Program" has two meanings: one as used here is that control structure of a special-purpose computer (formed either by circuit states or configurations) which directs its operation as does the "program" of any automatic machine; the other common usage, not involved in this case, is a symbolic record of those signals in human-readable form, say a list of computer language statements.

connection. Each form of construction for special-purpose computers, softwiring or hardwiring, has its own technological and economic costs and benefits. The choice of which form to use in a given situation is a complex decision based on various engineering and management trade-offs.[43]

None of the factors concerning the choice of hard- or softwiring has any relation to inventiveness of the underlying machine. If the circuit states and configuration of a particular special-purpose computer contain the elements of invention, the machine is patentable and the fact that the wiring is "hard" or "soft" is immaterial. The interchangeability of these two types of computer construction is summed up in the phrase: "the engineering equivalence of software and hardware."

B. *A special-purpose computer built by programming a general-purpose computer is a different machine than the general-purpose computer with its own unique circuit structure.*

It is necessary to understand the manner in which programming does in fact restructure the general-purpose computer to appreciate the defect in the Government's argument that a programmed general-purpose computer is not a machine but merely the "new use of an existing machine." Far from being a mere semantic device or legal fiction, the restructuring concept is technological fact. When a program is loaded into a general-purpose computer, a set of circuit states and electric impulses are created which are the control or program of the special-purpose computer. It is because the general-purpose computer is programmable that it may appropriately be viewed as a "warehouse of parts."[44] Without a program, the function circuits of a general-purpose computer neither operate nor co-act in a "dynamic interrelationship,"[45] they are just like unconnected resistors and transistors on an engineer's workbench. Loading a program brings these function circuits into a synergistic and dynamic relation and structures them just like hardwiring the circuits of a fixed-purpose computer or wiring together resistors, capacitors and transistors to make a radio.

43. Frequently, the decision is not made until well along in the design process after the basic structure of the special-purpose computer has been determined.

44. Patent Office 1966 Guidelines, 829 *O.G.* 441, 442.

All the evidence supports the factual reality of the restructuring principle.[46] The Board of Appeals specifically accepted it in this case (Pet. 28A), and the C.C.P.A. has so found in a long line of decisions.[47] The Government by using distorted quotes, making unsupported and unsupportable assertions, and relying on false metaphors, has attempted to mislead the Court to believe the facts are otherwise.[48]

The Patent Office Brief presents two positions on the restructuring issue, the first is factual and the second seeks to oppose the first with a legal argument. First, the Patent Office concedes in its brief the facts of the restructuring principle, that without "appropriate controls" a general-purpose computer cannot perform any significant operations, and that

> [t]he particular operations to be performed by a computer are governed by the state and configuration of its electronic circuitry . . . . Such circuitry can be fully built into the computer by wires and other physi-

45. Br. Pet. 36.

46. For a collection of the statements of computer experts see Jacobs, "Computer Technology (Hardware and Software): Some Legal Implications for Antitrust, Copyrights and Patents," *Rutgers Journal of Computers and Law*, Vol. 1970, No. 8, at 50.

47. *In re Prater*, 415 F.2d 1393 (1969); *In re Bernhart*, 417 F.2d 1395 (1969); *In re Mahoney*, 421 F.2d 742 (1970); *In re Musgrave*, 431 F.2d 882 (1970); *In re Foster*, 438 F.2d 1011 (1971).

48. The Patent Office approach is necessary to its case in the sense that once the fact of restructuring is accepted, the bulk of the Patent Office case — the argument against the patentability of programmed computers — dissolves.

cal elements (*i.e.*, as part of the 'hardware'), in which case, unless it is physically rewired, the computer will ordinarily serve only a specific purpose or application . . . .

Alternatively, the computer may be designed so that the state or configuration or its circuitry can readily be changed without rewiring or other visible physical changes. Such changes are accomplished by the use of different 'programs'. . . . (Br. Pet. 14, 15)

In the above quote, the Patent Office concedes the entire basis of respondent's case by admitting, clearly and concisely, the interchangeability or equivalence of hardware and software.[49] The very same structural changes in the state and configuration of the general-purpose computer can be accomplished either by hardware or software. To base disparate legal treatment upon a mode of construction has no justification in law, technology or common sense. Softwired (*i.e.*, wireless) programming is an historic advance over the wired program. The patent statutes and their constitutional base were not intended to be limited to a finite period of technological development. There is no justification for the Patent Office's position that technology has now outstripped the boundaries of patent law.

Compelled by the facts to admit the interchangeability and equivalence of hardware and software and the basic restructuring principles of the stored program concept, the Patent Office presents a second and completely opposite brief seeking to obfuscate its admission and to divert the attention of the Court from the inescapable conclusion that software is, of course, patentable equally with the hardware. The Patent Office makes three arguments to deny restructuring:[50] 1. It quotes out of context Judge Rich's use of the phrase "legal fiction" as it pertains to the

49. CBEMA's Brief *amicus* avoids mention of the engineering equivalence of software and hardware though its members have used this principle for decades in the engineering of their hardware and software.

50. Br. Pet. 33-35.

legal effects of the drafting of patent claims, distorting his meaning and seeking to confuse this Court into believing that Judge Rich was casting doubt on the technological principles of restructuring.[51] 2. It distorts the Board's position.[52] If there is any one principle that both the Board of Appeals and the CCPA agreed on in this case, it is the fact of the restructuring principle, applicable to a stored-program computer. The Board of Appeals did not hesitate to remind the Examiner of the facts of computer technology that an unprogrammed or differently programmed computer is not the same machine as the one that results from programming a general-purpose computer (Pet. 28A.) 3. The Patent Office compares a player piano whose components are never restructured to a general-purpose computer whose usefulness is totally dependent upon the restructurability of its circuits (the ability of a stored program to connect its circuits into a desired configuration). The Patent Office's frequent use of this player piano analogy—not accepted by the Court in *Benson*[53]—is inexcusable since it ignores the unique quality of general-purpose computers: without a program they have no function but they can be programmed to connect the elementary circuits of the general-purpose computer into an unlimited variety of new configurations, each generally unrelated to the elementary circuit functions. Only the general-purpose computer, not the player piano, is restructured by a program into a different machine, with a different function.

51. In fact, Judge Rich has made it clear in his "dissent" and in a subsequent writing (*see* fn. 28 *supra*) that he has not retreated from his agreement with the C.C.P.A.'s factual findings on restructuring set forth in *Prater* and *Bernhart*.

52. The Patent Office quotes the Board's opinion dealing with language in the patent claims that the Board questioned on formal grounds under 35 U.S.C. §112, and uses those quotes to argue "new use," on which the Board had reversed the Examiner.

53. *Gottschalk v. Benson*, 409 U.S. 63.

III. SOFTWARE IS NOT AN "ABSTRACT IDEA."

A. *The engineering of software.*

The software products segment of the computer industry is composed of hundreds of small and medium size companies, many of which are members of ADAPSO/SIA. On the staff of these companies are thousands of personnel actively engaged in programming. These programmers have I.Q.'s "well above the average college graduate."[54] Many have degrees in computer sciences, not infrequently at the masters and doctorate level. Many work with the precision of engineers in a field increasingly known as software engineering. They build software out of building blocks[55] to engineer the special-purpose computer in a hierarchical structure,[56] much the same as that required for other modern complex machines.

The automobile, for example, is a hierarchical machine system. The designer of the gearbox combines gears and other mechanical parts in a particular way without having to be concerned with or having any knowledge of the molecular structure of the steel used in the gears (which concern is left to a metallurgist). The designer of the overall transmission system simply configures gears, drive shaft, universal, and other elements without concern for the lower hierarchical levels of the specific internal structure of those individual components or of the structure of the steel.

In the hierarchy of computer systems, the logic circuit designer builds logic circuits such as "AND" and "OR" circuits without concern for the molecular structure of the individual transistors and other components that make up

54. *Psychology of Programming*, G. Weinberg, Van Nostrand Press, p. 161.

55. The building blocks of software and hardware are discussed in Jacobs, *supra*.

56. See "Hierarchies—Software Engineering Design," *Software Engineering, International Computer State of the Art Report*, 1972, p. 47 *et seq*.

those electronic circuits (which concern is left to component designers working at a lower level of hierarchy). The designer of the hardware function circuits such as "ADD," "COMPARE" and "STORE," configures logic circuits without concern for the detailed structure of the individual logic circuits he uses to construct the hardware function circuits. Similarly, the "programmer," the designer of the special-purpose computer, configures hardware function circuits into the structure of the ultimate special-purpose machine without concern for the detailed structure of the individual hardware function circuits. The same hierarchical process is followed if, instead of softwire programming, hardwire programming is used to build the special-purpose computer.

These building blocks lie on successive levels of a hierarchy[57] of circuit construction and the software engineering is performed at the highest level. The software itself, because of its complexity, often must also be constructed in a number of hierarchical levels, and the software engineer should preferably work like:

> ". . . the electrical engineer designing a new T.V. set [who] certainly doesn't design each vacuum tube, transistor, and capacitor all over again; he relies on existing components. In fact, he normally designs on a much higher level, using 'off-the-shelf' power supplies, oscillators, etc."[58]

A recent IBM report further demonstrates the similarities in software and hardware engineering:

> Structured programming reduces the arrangement of the program logic to a process like that found in [hardware] engineering where logic circuits are constructed from a basic set of figures. As such, it

57. See Jacobs, *supra*, for a discussion of the circuit interrelationships in the different hierarchical levels of a programmed computer.

58. The IBM report, "Composite Design: The Design of Modular Programs," Jan. 1973, p. 6.

represents a standard based on a solid theoretical foundation.[59]

Working at different levels in the system hierarchy of the special-purpose computer to be built, contemporary software engineers as that IBM report explains, may use a "structured programming"[60] approach similar to the design of other automatic machines:

> The top-down approach is patterned after the natural approach to system design and requires that programming proceed from developing the control architecture (interface) statements and initial data definitions downward to developing and integrating the functional units. Top-down programming is an ordering of system development which allows for continual integration of the system parts as they are developed and provides for interfaces prior to the parts being developed.[61]

In the Apollo Space Shuttle Software System, a mammoth software development effort:

> . . . program structuring is of major importance; decisions . . . determine the total structure of the software both statically and dynamically. Program structuring defines the building blocks, the control mechanisms and the interfaces of the software. It is in this effort that the interrelationship of systems software, applications software and data is entirely mapped out.[62]

The software engineer builds complex automatic machines as the foregoing examples amply demonstrates. Neither the software engineer nor the hardware engineer

59. "Management Concepts for Top-Down Structured Programming," IBM Report, February 1973, p. 1.

60. *Ibid.*, Abstract.

61. *Ibid.*, p. 6.

62. "Top-Down, Bottom-Up, Structured Programming & Program Structure," Draper Labs, MIT, Dec., 1972, pp. 28, 31.

devises "abstract ideas," or methods of transacting business," contrary to the Patent Office's suggestions (Br. Pet. 21), nor a "mathematical formula, a method of doing business, or an expression of a scientific principle or law of nature," as CBEMA would have the Court believe (Br. CBEMA 5). The software engineer is not constructing "new uses of an existing machine" nor anything resembling a "piano roll [in] an old player piano" (Br. Pet. 35).

Relying on the restructuring principle, the Board found that the respondent's program restructures the general purpose computer into a different machine and not a "new use." This issue did not arise in *Benson*, which dealt with process claims for a "mathematical formula," not with machines. Certainly the Court in Benson did not conclude that this technology was to be excluded from the patent system.

B. *The invention process in software.*

The design and development process in this technology is quite similar to that of any other technology. First the goal is decided upon, then the prior art is explored for possible solutions and, if not found, the "technological roadblocks" are identified.[63] Invention may take place in overcoming these roadblocks.

Parallels to the design and development process of other machines may be seen in the software design process presented in a paper at the World NATO Conference entitled "Software Engineering"[64] which took place in Germany in 1969 and was attended by over 50 experts and prominent leaders in the software field. The first seven stages[65] of this process from the concep-

63. *See, e.g., Computers in the 1980's*, R. Turn, Columbia Univ. Press, 1974, p. 21.

64. "Software Engineering," Report on a World Conference Sponsored by the NATO Science Committee, Garmisch, Germany, Jan., 1969, p. 13.

65. "a. Specification of the complete hardware-software system. b. Definition of the functions to be performed by the pro-

tion "of the complete hardware-software system" of the special-purpose computer to be built until the "detail design" is worked out, all involve areas for overcoming "technological roadblocks" and solving machine problems. Invention in the ultimate special-purpose computer may result from the working at the various hierarchical levels of this design process. An additional six stages in the above-cited design process involve testing and operation of the overall machine as well as its parts to determine if the "software-hardware package meets all of its design requirements." If not, further work and debugging at various of the first seven stages may result in other opportunity for invention.

Nothing in this design process is a "routine" task, as the Patent Office misleadingly suggests.[66] The design process suggested by the Patent Office (Br. Pet. 16-17) and CBEMA (Br. 5-6) bears no relation to that of the real computer world.

IV. COPYRIGHTS CANNOT ~~PREVENT~~ PROTECT MACHINE INVENTIONS; PATENTS, WHICH CAN, ARE NEEDED FOR SOFTWARE.

CBEMA's suggestions that copyright is a viable method of protecting inventions in programmed com-

Note 65—*Continued*
gram. c. Design and documentation of the master overall program plan. d. Subdivision of the large system program into manageable program blocks. e. At this point, the interfaces between the program blocks must be precisely defined and documented. Since the usual means of passing data between program jobs is via the use of data in the memory of the system, the fundamental program progress data in memory should be formulated and defined for the interfaces between each program block. f. Basic program subroutines defined and documented. g. Detail design, coding and documentation of each program block."

66. Unlike the creative process of designing the special purpose computer, the resulting machine is designed so that its mode of operation is "routine." A complex control task is performed by a combination of elementary machine circuits that are operated over and over again in the same exact way.

puters is contradicted by the constitutional limitation of copyright protection to "writings." Copyrights may only be used to protect particular printed records and descriptions of machines, but not the actual machine structure that they represent. To one whose innovation is a machine structure for a special-purpose computer built with software, only patent protection will suffice.

The copyright laws contain no novelty requirement; exclusive rights are predicated minimally on originality. CBEMA favors copyright protection because its members apparently are not interested in protecting the innovation in software (which may exist in 1% of all programs) but are interested in protecting the non-innovative aspects of software (perhaps 99% of all programs), the part of a machine which has never been protectable, neither by patents nor by copyrights. Such use of the copyright laws to protect non-inventive forms of programmed machines would be a circumvention of the constitutional requirement of novelty (inventiveness) for obtaining exclusive rights in a machine structure. *Graham v. John Deere Co.*, 383 U.S. 1.

Proposals have been made for registration systems (either similar to that of copyrights or of other forms) for the registration of computer programs. A registration system in the U.S. would have the same fundamental objections as those for copyright protection, because it would provide protection in the nature of exclusive rights for machine technology without being based on the constitutional requirements of novelty and invention.

The World Intellectual Property Organization, in considering a registration system that might be suitable in European and other countries, indicated that such a registration system should not be in lieu of patent protection for this technology, but in addition thereto. WIPO made it clear in 1974 that "patent protection should not be withheld from inventions for the reason that they involve computer programs,"[67] and again in 1975

67. WIPO-AGCP/NGO/9, July 5, 1974, p. 8, ¶ 58(b).

because they "involve a software element."[68] Thus WIPO indicates that it makes no sense to set a basis for patentability solely on the grounds of the mode of construction of the machine—the entire basis of the Patent Office's case.

Software is a new technology that is today viewed as the most critical and important element of a computer system. As in any new technology, for it to grow and compete, it needs all the protection due it under the law. ADAPSO/SIA asks the Court to treat the software technology equal to the hardware technology—no better—and no worse.

CONCLUSION

For the reasons stated above, it is respectfully urged that the writ of *certiorari* be dismissed. In the alternative, if this Court reaches the merits of the case, the decision of the Court of Customs and Patent Appeals should be affirmed.

Respectfully submitted,

DAVID COHEN
Attorney for Amicus
ADAPSO/SIA

68. WIPO-AGCP/NGO/II/11, July 14, 1975, p. 3.

Service of the within and receipt of a copy thereof is hereby admitted this ..... day of October, A.D. 1975.

IN THE

Supreme Court of the United States

October Term, 1975
No. 74-1033

C. MARSHALL DANN, COMMISSIONER OF PATENTS & TRADEMARKS,

Petitioner,

vs.

THOMAS R. JOHNSTON,

Respondent.

On Writ of Certiorari to the United States Court of Customs and Patent Appeals.

Brief Amicus Curiae for Los Angeles and Philadelphia Patent Law Associations.

JAMES W. GERIAK,
800 Wilshire Boulevard,
Los Angeles, Calif. 90017,
(213) 489-1600,
Attorney for Amicus Curiae.

Of Counsel:
THOMAS M. SMALL,
3435 Wilshire Boulevard,
Los Angeles, Calif. 90010,

JOHN C. DORFMAN,
The Fidelity Building,
123 South Broad Street,
Philadelphia, Penn. 19109.

Parker & Son, Inc., Law Printers, Los Angeles. Phone 724-6622

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Brief Amicus Curiae of the Los Angeles and Philadelphia Patent Law Associations Interest of Amicus.

The Los Angeles and Philadelphia Patent Law Associations consist of lawyers who regularly counsel their clients regarding the assertion of, and defense against, patent rights. These Associations appear here in an attempt to assist the Court in an orderly development of the patent law and, more particularly, to urge that it would be inappropriate to create a *per se* rule of computer program unpatentability and that the law should be allowed to develop on a case-by-case basis in this complex area.

In accordance with Rule 42 of this Court, these Associations have obtained the consent of both Petitioner and Respondent to the filing of this brief.

The Background Facts.

Computers have become a prominent part of contemporary life. The technology regarding computers has developed at an almost explosive rate and thousands of patents have been granted on computer-related technology. However, because of the rapidity with which computers perform their functions, a mystique of sorts has attached to them in the minds of some as having near-human qualities; a mystique that is baseless since computers in reality are as dependent on humans to operate them as are automobiles or aircraft.

The law of patents has not been immune from this mystique and it is believed that the present case bears witness to that fact. It is imperative that consideration of this case begin with a clear understanding of what is being claimed. As pointed out by the Court below,[1] claim 20 of the patent application is exemplary. For the purpose of determining whether the claim recites a machine, process, composition of matter or something else, it may be stripped of excess verbiage as follows:

> "20. A . . . *machine system* . . . comprising . . . a *data processor* including a *memory* . . .; a *processor* for combining and comparing . . .; *input* and *output* devices; . . . said *memory* including . . .; said *control system* including *means for directing* the processing . . . said processing directing means including *means for locating* . . .; and

[1] *In re Johnston*, 502 F.2d 765, 767 (CCPA 1974)

> *means for producing* an output record . . .; said output record producing means including *means for identifying* . . ." (emphasis added).

Thus, the claim recites in its preamble that it is a "machine system" and then recites ten different tangible components of that system which are variously identified as processors, memory, input and output devices, a control system and means for directing, locating, producing and identifying.[2]

Were this case concerned with virtually anything other than computers, it would seem extremely doubtful that there would be any disagreement with the view that the foregoing claim recites a "machine" in the sense of 35 U.S.C. 101 and in the sense that that word is generally used.

However, the claim includes elements which are conventionally referred to as computer "software" and there has been continuing controversy as to how software should be treated under the patent law.[3]

In a very oblique sense, an aspect of the software patentability issue reached this Court in *Gottschalk v. Benson*, 409 U.S. 63 (1972), but this Court was careful to state that it was *not* attempting to decide the broad issue and, at 409 U.S. 71, said:

> "It is said that the decision precludes a patent for *any program* servicing a computer. We do *not* so hold." (emphasis added).

[2] Claims couched in terms of "means for . . ." are expressly sanctioned by the third paragraph of 35 U.S.C. 112.

[3] See, *e.g.*, 1974 Committee Reports of the Section of Patent, Trademark and Copyright Law of the American Bar Association, Report of Committee 410 at pp. 306-314, which sets forth a comprehensive bibliography of legal publications on the subject.

The claims before this Court in *Benson* were *not* directed to a program, but rather to a *method for converting* a certain type of number, binary coded decimal numerals, into another kind of number, pure binary numerals. This method was held to be not patentable subject matter under 35 U.S.C. 101 because it was nothing more than an abstract principle even though it could be translated into a computer program. This was precisely the same as saying that the mathematical formula for converting fractions into decimals by dividing the numerator of the fraction by the denominator is not patentable *and* cannot be made patentable by recording it as part of a computer program any more than it could be made patentable by writing it on paper or engraving it in stone. This Court then went on to hold that if *that type* of program were to be made patentable, it would have to be by Congressional action and said, at 409 U.S. 72:

> "It may be that the patent laws should be extended to cover *these* programs, a policy matter to which we are not competent to speak. The President's Commission on the Patent System rejected the proposal that *these* programs be patentable. . . . If *these* programs are to be patentable, considerable problems are raised which only committees of Congress can manage. . . ." (emphasis added).

Thus, it would appear clear that this Court's discussion of Congressional action was directed only to the *particular type* of programs which it was considering in *Benson*, the only antecedent for "these programs"

being programs directed to such mathematical formulas. This is all the more so when it is kept in mind that, as recognized by Petitioner (Pet. Br. 15, 16), programs for general purpose digital computers fall into at least two broad categories, viz., "system software" which performs only certain standard essential operations, *e.g., translating*, sorting, etc. and "applications software" which make the computer perform desired operations, *i.e., control systems*. Petitioner further recognizes that the program claimed in combination with a computer in the present case is a *control* program (Pet. Br. 16). In contrast, the method considered by this Court in *Benson* was a *translating* method and the discussion of computer programs in that case was limited to *translating* programs. Thus, the issues in this case have little in common with those in *Benson*.

The precept that patents may not be obtained for mathematical formulas was not new in *Benson*; the decision cites a long line of earlier cases which so held, to which could be added *In re Bernhart*, 417 F.2d 1395, 1399 (CCPA 1969).

However, the Court of Customs and Patent Appeals has indicated that it finds the *Benson* decision by this Court to be somewhat inscrutable, *e.g.*, the concurring opinion by Judge Rich in *In re Christensen*, 478 F.2d 1392, 1396 (CCPA 1973) said:

> "The Supreme Court in *Benson* appears to have held that claims drafted in such terms are not patentable—for what reason remaining a mystery."

Against this background, Petitioner in the present case asks this Court to decide (as the first two of the three questions presented in the Petition):

> 1. Whether this Court's holding in *Gottschalk v. Benson*, 409 U.S. 63, that a new idea to be implemented by programming an existing computer is unpatentable when claimed as a new "process" also applies when the programmed computer is claimed as a new "machine system".
>
> 2. Whether programs for existing general purpose digital computers, however claimed, are patentable under present law. (Pet. 2).[4]

---

[4] "Pet." refers to the Petition for Certiorari.
"Br. in Opp." refers to the Brief in Opposition to the Petition.
"Pet. Br." refers to Brief for the Petitioner.
"CBEMA Br." refers to Brief Amicus Curiae for the Computer and Business Equipment Manufacturers' Association.

SUMMARY OF ARGUMENT.

Petitioner's question number 1 is obscurely put. It assumes as fact an issue which is hotly contested by the parties, viz., that the patent application claims are directed to an "idea" rather than a "machine", and then asks whether such supposed "ideas" are patentable under this Court's holding in *Gottschalk v. Benson*, 409 U.S. 63 (1972). The question could have been far more aptly put as follows:

> "Do the patent application claims recite a 'machine' within the terms of 35 U.S.C. 101?"

However phrased, the answer to the question is that the claims do recite a statutory machine and that this Court's decision in *Benson* is applicable, if at all, only as a precedent which might bear on the question of whether an unpatentable old machine or a patentable new machine is claimed.

Petitioner implicitly recognizes this fact by focusing his discussion of statutory subject matter (Pet. Br. 20-24) on his notion of the "gist" of the invention (Pet. Br. 20) rather than on the claims themselves and by then discussing at much greater length (Pet. Br. 25-37) *another* question, not expressly stated as one of the "Questions Presented" in the Petition: that of whether claiming the combination of an existing computer and a new program is a claim to an old machine or a patentably new machine. This question would be meaningless if the claims did not recite a statutory machine.

The amicus Associations believe that it would not be appropriate to formulate a *per se* rule of unpatentability, particularly in this case, for this question or its variant, petitioner's question number 2, the broad

issue of computer program patentability, "however claimed", because:

> 1. Computer programs can take, and have taken, many forms and can be used to perform widely varying functions. It is unreasonable to ask this Court to formulate a *per se* rule of law regarding the patentability of such subject matter which will effectively deal with the wide variety of known variables and also deal with advances in technology not presently known. Furthermore, there is no overriding reason why such subject matter should be singled out for special treatment in the manner of, *e.g.*, atomic energy. Certainly, Congress has taken no action to indicate that such special treatment is warranted.
>
> 2. The factual record in the present case, which consists only of respondent's patent application and the prior art cited by the Patent Office, is manifestly inadequate for an informed evaluation of the question. Neither the patent application nor the prior art attempts to deal with the broad question of computer program patentability and this Court would venture into deep water if it attempted to decide this issue without a fully developed record, including the testimony of experts who had been subjected to cross-examination and a documentary history of the development of computer programming to date.

As to Petitioner's question number 3, which goes to the ultimate question of patentability of the particular claims here in issue, the amicus Associations express no view, but do believe it appropriate to point out that Petitioner suggests an approach to this issue which

does not conform to this Court's prescription in *Graham v. John Deere Co.*, 383 U.S. 1 (1966).

The Claims Are Directed to a Machine, Not an Idea, and Are Statutorily Proper Under 35 U.S.C. 101.

As we have pointed out above, the machine system claims which are before this Court contain several indisputable "hardware" elements, *e.g.*, the "data processor" and the "input and output devices".[5] Thus, there can be no doubt that these claims are directed to a "machine" as that term is used in 35 U.S.C. 101 and according to the ordinary usage of that term.

Petitioner attempts to transmute this machine claim into a nonstatutory "idea" claim by focusing only on the control system which may be constituted as a computer program. This is simply an incorrect analysis.

Indeed, Petitioner has found it impossible to avoid conceding that the claims before this Court recite a machine. These concessions are several and we cite a few.

First, we note that the principal discussion of this issue at pages 13-20 does not once make reference to the claims, but rather devotes extensive attention to Petitioner's characterization of the "invention". However, at the terminal portion of this discussion (Pet. Br. 20), Petitioner did make a key concession when he said:

> "The 'means' *disclosed* by respondent are those of an ordinary general purpose digital *computer*, as presently used by banks, *with a program* directing these components of the computer to . . ." (emphasis added).

---

[5]See claim 20, quoted in *In re Johnston*, 502 F.2d 765, 767 (CCPA 1974).

If that statement were amended to read, "The 'means' disclosed *and claimed* . . ." it would accurately state the pertinent fact, viz., that the claims in question recite a machine, *i.e.*, a computer, in combination with a program and the points remaining for decision are whether the recitation of the program is sufficiently definite, and if so, whether it is an apparatus limitation which imparts patentability to the claim.

Second, it is clear that Petitioner has attempted to avoid dealing with what the claims *actually recite* by emphasizing the "essence", "heart", and "gist" (Pet. Br. 10, 18, 20) of the invention, as Petitioner sees it. However, such discussion is entirely beside the point. As this Court said in *Aro Manufacturing Co. v. Convertible Top Replacement Co.*, 365 U.S. 336, 345 (1961):

> Yet this Court has made it clear in the two Mercoid cases that there is *no legally recognizable* or protected 'essential' element, 'gist' or 'heart' of the invention in a combination patent." (emphasis added).

Just as it would have been improper to decide infringement in *Aro* by reference to only a part of the claim, so too would it be improper to decide patentability here only by reference to part of the claims.

Third, the discussion (Pet. Br. 25, 26) by Petitioner of the proposition that a new use of an existing machine is not patentable as a machine would be totally irrelevant if the claims presented here were not indeed directed to a machine. In fact, Petitioner, in the end, found it impossible not to say so:

> "Thus, rather than seeking a machine patent by claiming discovery of a new use for an existing machine (barred by long-standing authority). . . . *he presses his claims* in terms of a 'machine system' *consisting of the programmed computer*." (Pet. Br. 29, 30, emphasis added).

This is a flat recognition of the reality that the claims are directed to a statutory machine.

Although the claims clearly meet the requirements of 35 U.S.C. 101, that is not the end of the matter. In order to fully decide the question of claim patentability, it is necessary to consider whether claims (a) meet the requirements of 35 U.S.C. 112 for definiteness and (b) the requirements of 35 U.S.C. 102 and 103 for novelty and unobviousness. In order to do this, it is necessary to analyze what the program *is* and what it *does*.

In the present case, the amicus Associations express no view as to the ultimate outcome of these latter questions, but do urge to this Court that they *must* be reached since the claims recite a statutory machine. We do, however, note that several possibilities exist. Among them are the following:

1. This Court could find that the control system is an apparatus limitation and then consider patentability pursuant to 35 U.S.C. 102, 103.[6]

2. This Court might have found that the control system does not define an apparatus limitation with the particularity required by 35 U.S.C. 112.[7]

3. This Court could hold that the control system is not an apparatus limitation in the machine claim and, thus, while not improper, cannot be relied upon to impart patentability to the claim.[8]

---

[6]*Graham v. John Deere Co.*, 383 U.S. 1 (1966).

[7]This was the substance of this Court's holding when it invalidated claim 8 in *O'Reilly v. Morse*, 15 How. 62, 112 (1853). See *Gottschalk v. Benson*, 409 U.S. 63, 68 (1972). However, since Petitioner excludes Section 112 considerations from this case (Pet. Br. 5, fn. 5), it would appear that this issue has been conceded.

[8]Just as a process limitation in a machine claim, while not improper, cannot impart patentability to the claim, *In re Stephens*, 345 F.2d 1020, 1023 (CCPA 1965); *In re Moeller*, 117 F.2d 565, 567 (1941).

The last of these is the main thrust of Petitioner's Brief which contends that *Benson* requires such a result. We shall demonstrate that it does not and that it would be inappropriate to fashion a *per se* rule of unpatentability in this regard. However, in order to present this discussion in an orderly manner, we will first treat Petitioner's question number 2, which is broader, and goes to the patentability of programs for existing general purpose computers, "however claimed".

Benson Does Not Mandate the Unpatentability of Programs for Existing Computers.

The scant attention which Petitioner devotes to his question number 2 simply assumes the erroneous conclusion that this Court held in *Benson* that any and all programs for existing general purpose computers are unpatentable. In so doing, Petitioner relies *solely* upon this Court's statement at 409 U.S. 73, "if *these* programs are to be patentable", Congress will have to provide additional statutory authority (Pet. Br. 36). This, of course, raises the question of what type of program this Court was referring to when it said "these programs". Petitioner assumes in its brief, without any supportive reasoning, that "these programs" means any and all programs for general purpose digital computers.[9] Such an assumption must fall in the face of this Court's statement in *Benson* at 409 U.S. 71:

> "It is said that the decision precludes a patent for any program servicing a computer. We do not so hold."

[9]In apparent contradiction to the recognition at page 2 of his Reply Brief of the "possibility of patentability" of programs.

Rather, when the *Benson* decision is read as a whole, the following is clear:

1. The patent application claims before the Court were *not* directed to a computer program, but rather to a "method of converting signals from a binary coded decimal form into binary" and a "data processing method for converting binary coded decimal number representations" (409 U.S. 73, 74).

2. The question which this Court was deciding in *Benson* was *not* the patentability of computer programs but rather "whether the method described and claimed is a 'process' within the meaning of the Patent Act" (409 U.S. 64).

3. The controlling concept underlying the decision in *Benson* is that an idea, *i.e.*, a principle in the abstract, cannot be patented (409 U.S. 67, 71).

4. In *Benson*, this Court concluded that the impermissible patenting of an abstract principle "would be the result if the formula for converting BCD numerals into pure binary numerals were patented in this case" (409 U.S. 71).

5. The process claims were considered to be so "abstract and sweeping" as to be capable of being "performed through any existing machinery or future-devised machinery or *without any apparatus*." (emphasis added, 409 U.S. 68).

6. This Court also noted, "the mathematical formula involved here has no substantial practical application except in connection with a digital computer" such that if a patent were granted. "the patent would wholly pre-empt the mathematical formula and in practical effect would be a patent on the algorithm itself" (409 U.S. 71. 72).

It was only then that this Court said "It may be that the patent laws should be extended to cover *these* programs" and that it was up to Congress to determine "if *these* programs are to be patentable". In so doing, this Court transferred its attention from what was being claimed and what it was holding unpatentable, viz., the "idea" or mathematical formula, to the *end use* of that idea or mathematical formula, viz., a computer program employing the formula. Thus, this Court's several references to "these programs" must, we believe, be taken to mean programs which are nothing more than computer translations of abstract mathematical formulas. This is, in effect, no different from holding that such an abstract mathematical formula cannot be patented by writing it on a piece of paper and then attempting to patent the paper together with the writing as an "article".

For example, this Court's holding in *Benson* could be expressed with regard to more familiar subject matter by observing that it dealt with a mathematical manipulation of precisely the same character as the conversion of fractions to decimals by dividing the numerator of the fraction by the denominator. This conversion of fractions to decimals is similarly an abstract princple and could not be rendered patentable by writing it down or by translating it into "computer language" in a computer program.

A Per Se Rule of Computer Program Unpatentability Would Be Inappropriate.

It would be a long, and unwarranted, step to conclude that because the abstract mathematical formulas considered by this Court in *Benson* were unpatentable and, presumably, would be unpatentable if claimed as

computer programs, that *any and all* computer programs, "however claimed", are unpatentable. To do so would be tantamount to saying, "there is nothing left to invent; all that can be invented has been done" and would thrust this Court into the role of attempting to command the tide of technological development relating to computer programs under circumstances not unlike those confronting King Canute. Rather, this is an occasion for exercise of the "responsible humility" which this Court has deemed appropriate in other cases.[10]

In this regard, as recognized by Petitioner (Pet. Br. 15, 16), programs for general purpose digital computers fall into at least two broad categories, viz., "system software" which performs only certain standard essential operations, *e.g., translating,* sorting, etc. and "applications software" which makes the computer perform desired operations, *i.e., control systems.* Petitioner further recognizes that the program claimed in combination with a computer in the present case is a *control* program (Pet. Br. 16). In contrast, as we have just pointed out, the method considered by this Court in *Benson* was a *translating* method and the discussion of computer programs in that case was limited to *translating* programs.

Furthermore, when a program functions to *control* a computer, the program is not unlike a cam arrangement in conventional machinery, *i.e.*, the computer responds to the control program in much the same way that the machine responds to the cam control. We believe that this Court would reject rather firmly the contention that *no* cam arrangement could *ever* be patentable, "however claimed". This would remain so even

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[10] *Beauhernais v. Illinois*, 343 U.S. 250, 262 (1952); *Rochin v. California*, 342 U.S. 165, 168 (1952).

if the cam arrangement was removable such that a first cam could be removed and a second substituted. Patent Office Class 74, subclass 567, is entitled "Cams" and contains many patents. Thus, the analogies to piano rolls, etc. (Pet. Br. 35) offered by Petitioner are hardly exhaustive and are somewhat misleading.

Still further, if this Court were ever to attempt to decide the broad question of whether computer programs for general purpose computers are patentable, however claimed, it would be hard to imagine a record less suitable for consideration of that issue than the present case.[11] Here, we have only the *ex parte* record created in the Patent Office, the factual content of which consists only of the patent application itself and the prior art. There has been no testimony, expert or otherwise, and it is certain that the patent application before this Court made no attempt to address itself to the broad question of patentability of computer programs. The numerous references (our count is 20) to extra-record technological and media sources in another amicus brief (CBEMA Br.) bear witness to the paucity of the factual record before this Court and it is worth noting that the statements made in those extra-record sources have not been subjected to cross-examination nor is there any way for this Court to determine whether those statements represent minority or even discredited views. The amicus Associations have had neither the time nor the technologically informed resources to be of assistance to the Court in this regard.

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[11]As in *United States v. Appalachian Electric Power Co.*, 311 U.S. 377, 423 (1940), it is "beyond the judicial function" to "predetermine the rights" of different parties in a matter "pregnant with the future controversy".

A Per Se Rule That a New Program Combined With an Existing Computer Cannot Be Patentable Is Equally Inappropriate.

If a *per se* rule that programs for existing computers are unpatentable is inappropriate, this is all the more so with regard to claims directed to programmed computers, *i.e.*, to the combination of such programs with existing computers. Petitioner conceded this at page 2 of his Reply Brief when he said:

> "To the contrary, we recognize the possibility of patentability if a program co-acts with an *ordinary computer* in a 'synergistic' way, if the program is carried out with newly-invented apparatus, or if a program produces a new use for an old machine sufficiently inventive to be patentable as a process." (emphasis added).

Thus, Petitioner's strenuous argument that the combination of a new program with an existing computer does not create a patentably new machine seems to be directed much more to the facts of the present case than to the general proposition and Petitioner suggests as much, *e.g.*, Pet. Br. 31, where the argument is reduced to "respondent's patent application, at least", and the reiteration of the "synergism" exception at Pet. Br. 29. The latter is nothing more than a statement that the claims must be unobvious within the meaning of 35 U.S.C. 103 as per the cases cited by Petitioner.

Indeed, it is the test for patentability under 35 U.S.C. 103 in the manner prescribed by this Court in *Graham* which should be applied in this case. However, Petitioner makes contentions which do not conform to the traditional approach of *Graham* and it is to this which we turn next.

Patentability Should Be Determined According to the Prescription of Graham.

In *Graham*, this Court held that the issue of unobviousness was to be decided by first determining the scope and content of the prior art, the level of skill in the art and the differences between the prior art and the claimed invention, and then determining whether such differences would have been obvious to one of ordinary skill in the art at the time the invention was made.

In a serious distortion of the prior holdings of this and other courts, Petitioner urges that the inventor's own conception should be used as prior art against him and even if the conception is unobvious, the implementation of that conception (or "idea") must *also* be unobvious in order for patentability to exist (Pet. Br. 22-24). Patentability should not be, and has not been, judged by such a 4-foot yardstick. The courts and Congress have been consistent in recognition of the fact that the hurdle of unobviousness must be cleared only once in order to obtain a patent. A few examples will suffice. Charles Goodyear's conception or "idea" that rubber could be effectively vulcanized by adding sulphur to a mass of rubber is generally recognized as a significant contribution to mankind and was patented. Yet, the *implementation* of that idea amounted to nothing more than adding sulphur to rubber and the implementation could hardly have taken any other form. Similarly, the conception or "idea" of Wallace H. Carrothers that certain chemicals could be reacted to produce a useful plastic material (nylon) was implemented by placing those chemicals in a suitable container, *e.g.*, a test tube or beaker, and allowing them to react. Given the idea, could that implementation have been held to be unobvious? The same would be true of most chemical reactions. Yet, a patent was granted to Carrothers and hundreds of thousands of other chemical reactions have been patented. Still further, 35 U.S.C. 100(b) expressly provides that a new use of a known machine, process, or composition is patentable as a process. Given the conception or "idea" of making such a new use of a known machine, process or composition, Section 100(b) would be rendered meaningless if there was an additional *requirement* that the implementation of the idea also be unobvious. In this regard, it is also to be noted that Section 100(a) provides that "invention", as used in Title 35 of the United States Code, means an "*invention or discovery*" (emphasis added). Stated differently, if applicant's "idea" is, in effect, used as prior art against him, the result is a hindsight approach to the issue of patentability which this Court has many times condemned, most recently in *United States v. Adams*, 383 U.S. 39, 50 (1966) where, in the course of determining that a patent directed to a battery was valid, this Court ruled that it "begs the question" to state that the battery components claimed in combination were known to have been used individually as such components in other batteries. Rather, this Court pointed out that the issue was whether "bringing them together" was patentable. However, given the idea of bringing them together, the implementation of that idea could not be said to be unobvious since it involved nothing more than putting the components together in a conventional manner to construct a battery. To the extent that there is language in *Funk Bros. Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127 (1948) which can be read to express a different standard of patenta-

bility (as contended at Pet. Br. 23, 24), that language must be kept in the context of *Funk* and not interpreted in a manner inconsistent with *Graham*, *Adams* and the 1952 Patent Act.[12]

Finally, we note briefly some rather serious flaws in law and logic in other contentions pressed by Petitioner on the issue of patentability. They are:

1. That a grant of patent claims directed to a computer in combination with a program would "impermissibly" (Pet. Br. 36) withdraw from the public its right of free access to the computer once patents, if any, covering the computer had expired. This is flagrantly untrue. Such withdrawal as might result would be no different from the "withdrawal" of the wheel which occurred when a patent was granted on the automobile and, again, on the airplane, etc. It is a self-evident fact of technological development that most inventions are made by making new combinations of old elements, *e.g.*, the very patents on computers to which Petitioner does not seem to object would "withdraw" from use transistors, capacitors, resistors, switches, etc., which themselves may or may not be the subject of expired or unexpired patents.

2. That grant of a patent on the combination of a computer and a program would "conflict" with patents already granted to the inventors of the computers (Pet. Br. 36, footnote 37). This is a misstatement of fact. It frequently occurs that a first patented device, *e.g.*, a switch, is used in a second patented device, *e.g.*, a computer. If this

[12]See *Blonder-Tongue Laboratories v. University of Illinois Foundation*, 402 U.S. 313, 333 (1971), requiring use of the *Graham* standards.

occurs, the computer inventor and manufacturer who uses the patented switch must pay license royalties or infringement damages. Certainly, grant of the second patent, *e.g.*, on the computer, does not deprive the owner of the patent on the switch "of all the uses to which it can be put".

3. That granting a patent on the combination of a computer and a program would be a "simple" way of "circumventing" the principle that an idea is not patentable by using the "facile drafting device" (Pet. Br. 29) of claiming the invention in the form of a machine rather than as an idea. This is somewhat startling. The entire thrust of *Benson* and the many precedents which it cites are that ideas must be claimed in tangible form to be patentable. To do so is no more "facile circumvention" than the claiming of a new use of an existing composition as a process (*e.g.*, a method of treating a disease by administering the compound) rather than the composition (*e.g.*, a known chemical compound which would be unpatentable), as prescribed by 35 U.S.C. 100(b).

4. That "hardware" may be patentable but "software" in combination with a computer is not (Pet. Br. 32). The words "software" and "hardware" must be used with caution. Much "software" would be considered by the ordinary observer to be quite "hard", *e.g.*, the tapes, drums, discs, etc. described by this Court in *Benson* at 409 U.S. 65. Furthermore, the fact that something is "soft", *e.g.*, made from paper, does not render it unpatentable. For example, Patent Office Class 283 is devoted to "Printed Matter" and has existed in that form since 1918, during which time thou-

sands of patents have been granted for paper goods such as the labels and tags of subclass 18 and the checks of subclass 58 of Class 283. Thus, to determine patentability based upon the hardness or the softness of the subject matter is to use the wrong criterion. Rather, the issue must be decided on the basis of what the subject matter is and what it does.

5. That there is something inherently repugnant to the law in a "legal fiction" (Pet. Br. 13). If it were a legal fiction that the combination of a computer and a program were a new machine rather than actual fact (a determination which we believe must be made on a case-by-case basis), it would remain to be decided whether the legal fiction should be given effect. So-called legal fictions are deeply woven into our jurisprudence, *e.g.*, the proposition that a corporation is a person, and they have been employed to the great benefit of society, not to its detriment.

6. That a "program" and a "formula" are identical (Pet. Br. 17, footnote 16) and that all programs are for the purpose of "translation" (Pet. Br. 29). We have earlier noted that refutation of this notion found in Petitioner's Brief itself, at pages 15 and 16, where it is recognized that it is only one type of program that performs a translating function and that another type performs a control function.

Conclusion.

The amicus Associations urge this Court to:

1. Affirm the holdings of the Court below that the claims recite a statutory machine within the meaning of 35 U.S.C. 101;

2. Decline to fashion a *per se* rule of unpatentability for computer programs or programmed computers.

While the amicus Associations express no view on the ultimate issue of the patentability of the claims presented in this case, they do urge that this issue be decided according to traditional principles of patent law. Petitioner has clouded this issue with several erroneous contentions which we have pointed out above.

Respectfully submitted,

JAMES W. GERIAK,
Attorney for Amicus Curiae.

Of Counsel:
THOMAS M. SMALL,
JOHN C. DORFMAN,

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No. 74-1033

In the Supreme Court of the United States

OCTOBER TERM, 1975

C. MARSHALL DANN, COMMISSIONER OF PATENTS AND TRADEMARKS, PETITIONER

v.

THOMAS R. JOHNSTON

ON WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

REPLY BRIEF FOR THE PETITIONER

ROBERT H. BORK,
Solicitor General,
THOMAS E. KAUPER,
Assistant Attorney General,
HOWARD E. SHAPIRO,
Assistant to the Solicitor General,
RICHARD H. STERN,
ROGER B. ANDEWELT,
Attorneys,
Department of Justice,
Washington, D.C. 20530.

JOSEPH F. NAKAMURA,
Solicitor,
JERE W. SEARS,
Deputy Solicitor,
United States Patent and Trademark Office,
Washington, D.C. 20231.

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Respondent's contention (Br. 22–42) that the claimed "invention" is a new machine within the scope of 35 U.S.C. 101 exalts the form in which patent claims are drafted over their substance. If the argument were accepted, this Court's decision in *Gottschalk* v. *Benson,* 409 U.S. 63, would be nullified simply by artful claims drafting describing computer programs in generalized "means plus function" terminology,

seemingly like that sometimes used in claims for real apparatus machinery.

Respondent's alleged invention is not a "machine" in any traditional sense, however it is claimed; it is simply a computer program put into a conventional general purpose digital computer. It is thus a machine only in the fictional sense, as can be seen from an examination of the specification and claims in the application.[1] They disclose not new apparatus, but simply the idea of using existing general purpose computers to maintain individual financial accounts in banks and credit systems, expressed as a computer program.

A. The specification in petitioner's application, particularly its introduction (A. 3—A. 5) and conclusion (A. 66—A. 67), describes an automatic record keeping system which uses a stored program digital computer to process bank customers' personal and business financial records. It operates by assigning category codes to be marked on the checks and deposit slips of the customer, according to the nature of the transaction. The specification then describes, in detail, a sequence of steps by which a computer may be programmed to operate the system.

Respondent distinguishes, moreover, between programming a general purpose computer to perform the

[1] A specification and claim are required by 35 U.S.C. 112. The specification is—

"a written description of the invention, and of the manner and process of making and using it * * * and shall set forth the best mode contemplated by the inventor of carrying out his invention.

"The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. 112.

recordkeeping, and constructing a special purpose computer to do so. His specification points out that "[i]n addition, the principles of this invention are applicable for use with a special purpose computer having all of the control mechanisms of the various runs and the files built into the computer in the form of equivalent logic design" (A. 66). Nonetheless, it continues, "the stored-program form of the invention described above is preferred in that it is comparatively much less expensive and more compact" (A. 67).

Finally, the specification supplies, as an example of "the best mode" required by 35 U.S.C. 12, "a printout of a complete program of one form of this invention for use in the IBM 1400-series computers" (A. 67), in a conventional computer language, Autocode, and states that "the program when assembled into the machine language for said IBM computer, controls and directs the operation of that computer in accordance with the invention * * *" (*ibid.*)

The foregoing, as the court below recognized, obviously describes nothing more than a computer program for providing financial statements to bank customers containing individual accounting details derived from category codes for particular transactions.[2]

[2] In determining whether respondent's invention constituted statutory subject matter the court below stated (Pet. App. 13A; second emphasis added):

"Such *machine* systems, *which comprise programmed digital computers*, are statutory subject matter under the provisions of § 101 * * *."

Judge Rich, in dissent, agreed with the majority's characterization, stating that we all know "the *invention* to be a new program" (Pet. App. 19A). Moreover, respondent has conceded that the

B. The claims (A. 107—A. 109) "point out and distinctly claim" under Section 112 only the idea of using categories to maintain individual financial records. They are broadly phrased to include any data processing systems, consisting of the equipment conventionally utilized in general purpose digital computers (memory, processor for combining and comparing coded signals, in-put and out-put devices, and a control system), when operated by the sequence of steps respondent utilizes to produce category totals for individual accounts. The claims, however, are not on their face limited to demand-deposit banking accounts, and the specification expressly states that it is not so limited (A. 65).

Respondent's claims that the subject matter thus specified and claimed are a process—"a new use of a known * * * machine" (35 U.S.C. 100(b)), *i.e.*, the general purpose digital computer—were abandoned in the court below following this Court's decision in *Benson* (Pet. App. 2A n. 1). Thus the only issue is whether a computer program can be claimed as a machine under the legal fiction that for purposes of 35 U.S.C. 101, the combination of a stored program and a general purpose computer creates a new special purpose computer.[3]

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invention was "reduced to practice in software form of computer programs" (*ibid.*) and "is being sold as a computer program to banks and to other data processing companies" (*ibid.*).

[3] Although the respondent's own specification distinguished between general purpose and special purpose computers (A. 66), he now asserts in this Court that he has invented a new "special-purpose computer which is preferably constructed with a stored program and a general-purpose computer" (Resp. Br. 23).

C. As Judge Rich correctly noted below, there is "no realistic distinction in kind between the Benson et al. invention and the invention here" (Pet. App. 21A). Both cases involve attempts to patent a computer program; both, in effect, involve attempts to patent an idea (one a mathematical idea and the other an idea for a method of doing business); and, in each case, the alleged invention has no practical application except when it is used in a digital computer. Respondent's attempted distinction between the forms of the claims—the *process* claims of Benson and the *machine* claims of Johnston—is without rational significance. As Judge Rich observed (Pet. App. 20A), and as is shown in Pet. App. D, a trivial modification of the *Benson* claim language converts such claims into "machine" form. Certainly, *Benson* involved more than the formalities of claim drafting. It looked to the substance of the patentability of computer programming.

Respondent's patent claims are no more limited to a particular art or technology, or directed to tangible machinery, than the *Benson* claims were or would be if they were redrafted into this same, fictitious "new machine" format. The respondent's specification and claims no more describe a "new machine" than would Benson's if restated in machine form (Pet. App. D). In its "best mode" the "discovery" is simply an old IBM computer into which respondent has inserted a new computer program. Respondent's contention (Br. 42) that a "machine is not an idea" begs the issue. Regardless of how his claims are

drafted, respondent has invented no hardware and uses only IBM's old hardware without any machine improvement of his own.

Respondent's complicated explanation of the circuitry of a programmed computer (Br. 29–34), and his labelling of a digital computer as a mere "storehouse of parts" (Br. 34), both fail to overcome the basic fact that this computer program is intended to provide, and is saleable only because it provides, a new use for the existing machines that the customers already possess. And that is what this Court in *Benson* held could not be patented. All complex machines are storehouses of parts, but they are parts which can be used for a purpose. Respondent has invented no such parts, but at most, only a non-patentable use of the existing parts. He has "constructed" no machine, but has simply proposed a switching arrangement amount the finite number of circuits available in existing general purpose digital computers.[4]

3. Respondent is incorrect in the contentions (Br. 37–41) that hardware or wired circuitry for programming or equipping special purpose computers

[4] The general purpose digital computer is specifically designed to perform a wide variety of data processing tasks. That is its function—its *raison d'etre*. It is the function of the computer program, within the structural limitations inherent in the computer employed, to direct the computer to process data in a specific way. A program is basically a switching arrangement among available electronic pathways, analogous to the switching system in a railroad yard. See Murphy, *1 Basics of Digital Computers*, p. 80 (1958). Thus, pragmatically, whenever a new program is developed it represents a new use for the standard, general purpose digital computer.

(which are not reprogrammable without rewiring them) and software programming for general purpose computers (which may be reprogrammed without rewiring them) are fully equivalent, and that since hardware-equipped, special purpose computers are recognized to be patentable machines then it follows that software-programmed computers must also be. Even if a general purpose digital computer is programmed to perform the same tasks as a specific-purpose, unprogrammable computer machine, the two are not the same under 35 U.S.C. 101, because they do not employ "the same or equivalent machine means." *Digitronics Corp.* v. *New York Racing Association, Inc.* (Docket No. 67 C 1119, E.D. N.Y., decided September 16, 1975), slip op. 213.[5] They are two different methods or means of obtaining the same end result—the first, by building a new hardware machine; the second, by putting an existing hardware machine to a new use. *Id.* at 212. A new use of an old machine is simply not a new machine; Congress made this

[5] In *Digitronics*, the court held that a general purpose digital computer programmed to perform the same function as a patented, special-purpose machine does not infringe the patent on the machine. Slip op. at 212. The court noted (*id.* at 213):
"The programmed general-purpose digital computer * * * does the same tasks but not by the same or equivalent machine means. Rather it performs the tasks—putting it most favorably to plaintiff—by a new use of a known machine and that is a process under 35 U.S.C. 100(b)."

clear in expressly providing for the patenting of new uses as processes, not as machines (35 U.S.C. 100(b)).

In any event, in the instant case, use of wired computer circuitry (instead of software programming) is without substantial practical application, as the specification observes (A.67), for it would destroy the versatility of the general purpose computers rented or otherwise employed by the banks (see Pet. Br. 32–34). The argument thus does not apply to the computers used here.

Finally, the argument is based on a *non sequitur*. Even if wired computers functioned similarly to software-programmed computers, it would not follow that Congress could not make the former patentable and the latter unpatentable, or even that it was irrational to do so. In economic regulation of this kind Congress must always strike a balance and draw dividing lines. See *Goldstein* v. *California*, 412 U.S. 546, 569–570. Certainly, on the one hand to allow "new machine" patents on newly-built machines only, and on the other hand to permit no more than method patents on new uses of old machines that function similarly to newly-built machines (when directed in a particular new way to do so)—is to strike a rational balance between the rights of owners of old machines (cf. *Aro Mfg. Co.* v. *Convertible Top Co.*, 365 U.S. 336, 342–343) and devisers of new ways to use them.[6]

[6] Significantly, the Report of the President's Commission on the Patent System, p. 13 (1966) concluded that "creation of programs has undergone substantial and satisfactory growth in the absence of patent protection and that copyright protection for programs is presently available." *Benson*, *supra*, 409 U.S. at 72.

Striking such a balance is all the more rational when there is taken into account the fact that the owner of a "machine" patent (unlike the owner of a "method" patent) can lawfully require the would-be user to purchase the necessary machinery from the patentee or his designee. Compare 35 U.S.C. 154, 271, with *B.B. Chemical Co.* v. *Ellis*, 314 U.S. 495; *Leitch Mfg. Co.* v. *Barber Co.*, 302 U.S. 458. Thus, the owner of a "new machine" patent based on a computer program presumably could, if such patents were allowed, compel the purchase of the computer from him or his designee as the condition for use of the program.

4. Respondent contends (Br. 58–64) that a holding that his claims are nonstatutory under 35 U.S.C. 101 would deprive him of his constitutional right under the Fifth Amendment to equal protection of law, stating that "Equal Protection Requires that Respondent's Machine Invention Be Given the Same Patent Protection Afforded any New and Unobvious Machine." This contention is unfounded.

First, the application involves only a computer program useful for implementing a business idea, not a new machine under 35 U.S.C. 101. Next, respondent has no constitutional right to receive a patent for a "discovery" falling outside the scope of 35 U.S.C. 101. Article I, Section 8, grants Congress the power "To promote the Progress of Science and useful Arts by securing for limited Times to * * * Inventors the exclusive Right to their * * * Discoveries." Congress is given broad discretion to determine when "the Progress of Science and useful Arts" is best served by a grant of exclusive rights to discoveries (see *Gold-*

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stein, supra), and what types of discovery should be included within the definition of patentable subject matter in 35 U.S.C. 101. If changing technology has overtaken its definitions, it is for Congress to strike the new balance between public availability of existing technology, and private reward for creativity. *Twentieth Century Music Corp.* v. *Aiken,* 422 U.S. 151, 156; *Teleprompter Corp.* v. *Columbia Broadcasting System,* 415 U.S. 394; *Fortnightly Corp.* v. *Artists Television,* 392 U.S. 390. There have been numerous significant "discoveries" (in the non-statutory sense) that fall outside Section 101.[7] Congress has so far left computer program ideas (particularly those that are merely computer language translations of ideas for doing mathematics or doing business) in that category.

5. Respondent (Br. 55–56) and *amicus* American Patent Law Association (Br. Amicus Curiae for Am. Pat. L. Assn. 7–10) each contend that the Commissioner has set forth an incorrect standard of patentability (see Pet. Main Br. 22) that improperly extends this Court's decision in *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.,* 333 U.S. 127, beyond the field of biological and similar natural phenomena. In *Benson,* however, this Court made it clear that the standard of patentability set forth in *Funk* is not so limited

[7] *E.g.*, Faraday's laws of electromagnetism, Gibb's phase law and his discovery of vectors, Einstein's two theories of relativity, Russell's and Boole's discoveries in logic (important in the computer field). See generally *Graham* v. *John Deere Co.* 383 U.S. 1, 8–9 and n. 2 (quoting Thomas Jefferson on ideas).

as respondent would have it (409 U.S. at 67–68, emphasis added):

> *Phenomena of nature,* though just discovered, *mental processes,* and *abstract intellectual concepts* are not patentable, as they are the basic tools of scientific and technological work. As we stated in *Funk Bros. Seed Co.* v. *Kalo Co.,* 333 U.S. 127, 130 "He who discovers a hitherto unknown phenomenon of nature has no claim to a monopoly of it which the law recognizes *If there is to be invention from such a discovery, it must come from the application of the law of nature to a new and useful end."* We dealt there with a "product" claim, while the present case deals with a "process" claim. But we think the same principle applies.

In the present case the respondent's alleged "discovery" or "invention" clearly falls within the class the Court considered in *Benson.* It is simply an abstract concept, a method of doing business, the idea of having banks provide their customers with certain bookkeeping services that the customers would otherwise have to do themselves. This business idea is analogous to the idea of providing customers with a drive-in movie, considered in *Loew's Drive-In Theaters* v. *Park-In Theatres,* 174 F. 2d 547 (C.A. 1), in which the court adopted the same reasoning as *Funk* and concluded (*id.* at 551, emphasis added):

> The basic question in this case as we see it is whether, given the idea or conception of an open-air drive-in theatre, an exercise of the inventive faculty was required to devise the means for carrying it out. For it is elementary

> that however new and useful, or even revolutionary and beneficial to humanity, an idea may be, it is not of itself patentable.

Neither *Eibel Process Co.* v. *Minnesota & Ontario Paper Co.*, 261 U.S. 45, nor *United States* v. *Adams*, 383 U.S. 39, suggests a different result. In *Eibel* the prior art machinery employed in the paper industry could not be successfully operated at high speeds without producing defects in the paper, and the technological cause for this mechanical difficulty was unknown. Eibel discovered the mechanical cause of the defect, which no one else had been able to do, and how to build into machines a change which eliminated the problem. "It was the discovery of the source [of the trouble] not before known and the application of the remedy for which Eibel was entitled to be rewarded in his patent" (261 U.S. at 68). In the present case, all we have is respondent's recognition that it might be profitable for banks to add, as an adjunct to their existing checking account business, the service of classifying checks and deposit slips into specified categories, *plus* respondent's devising conventional means of implementing this idea.

In *Adams* the discovery was that a magnesium-cuprous chloride battery could operate with water for the electrolyte and furnish "the first practical, water-activated, constant potential battery which could be fabricated and stored indefinitely without any fluid in its cells" (383 U.S. at 43). The case did not concern statutory subject matter under Section 101, but whether the invention lacked novelty under 35 U.S.C. 102(a) and was obvious from prior art (35 U.S.C.

103). Adams did not, as did respondent, discover an idea whose implementation, "given the idea" required no "exercise of the inventive faculty * * * to devise the means for carrying it out" (*Loew's, supra*). Nothing in *Eibel* or *Adams* in any way detracts from *Funk*, because they do not remotely involve the aspect of *Funk* that this Court relied on in *Benson* and on which we rely here.

CONCLUSION

For the reasons stated in petitioner's main brief and this reply brief, the judgment of the Court of Customs and Patent Appeals should be reversed.

Respectfully submitted.

ROBERT H. BORK,
Solicitor General.
THOMAS E. KAUPER,
Assistant Attorney General.
HOWARD E. SHAPIRO,
Assistant to the Solicitor General.
RICHARD H. STERN,
ROGER B. ANDEWELT,
Attorneys.

JOSEPH F. NAKAMURA,
Solicitor,
JERE W. SEARS,
Deputy Solicitor,
United States Patent
and Trademark Office.

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